Nova Scotia

ANNUAL REPORT

for the fiscal year
ending March 31, 1990

Department of Mines and Energy

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91-06800/

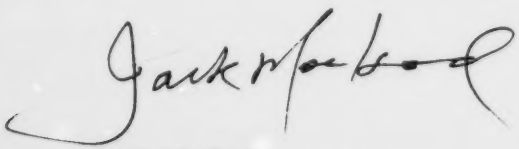
PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Lloyd R. Crouse, P.C.
Lieutenant-Governor of Nova Scotia

Sir:

I have the honour to submit herewith the Annual Report of the Department of Mines and Energy of the Province of Nova Scotia for the period April 1, 1989, to March 31, 1990.

Respectfully submitted,



Jack MacIsaac
Minister of Mines and Energy

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Jack MacIsaac
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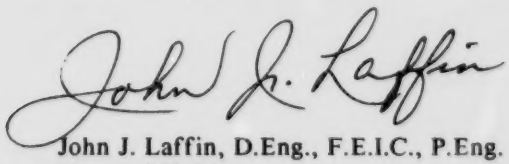

John J. Laffin, D.Eng., F.E.I.C., P.Eng.
Deputy Minister

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ORGANIZATION AND PERSONNEL OF THE DEPARTMENT

ORGANIZATION

The Department of Mines and Energy is organized into six divisions. Three of these divisions - Mineral Resources, Mineral Development and Mining Engineering - are grouped together in the Mines and Minerals Branch under an Assistant Deputy Minister (ADM). The Energy Resources, Energy Management, and Economics and Statistics Divisions form the Energy Branch, also under the direction of an Assistant Deputy Minister. The two ADMs and the Director of the Administration Division report to the Deputy Minister. The organization of the department as of 31 March 1990 is shown in Figure 1.

PERSONNEL AND OFFICES

The department has 162 employees, most of whom are employed in Halifax and Stellarton.

Halifax

Founders Square, 1701 Hollis Street	
Mines and Minerals Branch	424-5346
Mining Engineering Division	424-5764
Mineral Development Division	424-4162
Energy Branch	424-5351
Energy Resources Division	424-5933
Energy Management Division	424-4629
Economics and Statistics Division	424-8035
Brewery Complex, 1496 Lower Water Street	
Mineral Resources Division	424-4700

Stellarton

32 Bridge Avenue 752-8430

- Mineral Development Division
  (resource geology, exploration monitoring, core library)
- Energy Resources Division
  (coal exploration)
- Engineering Division
  (drilling, maintenance work)

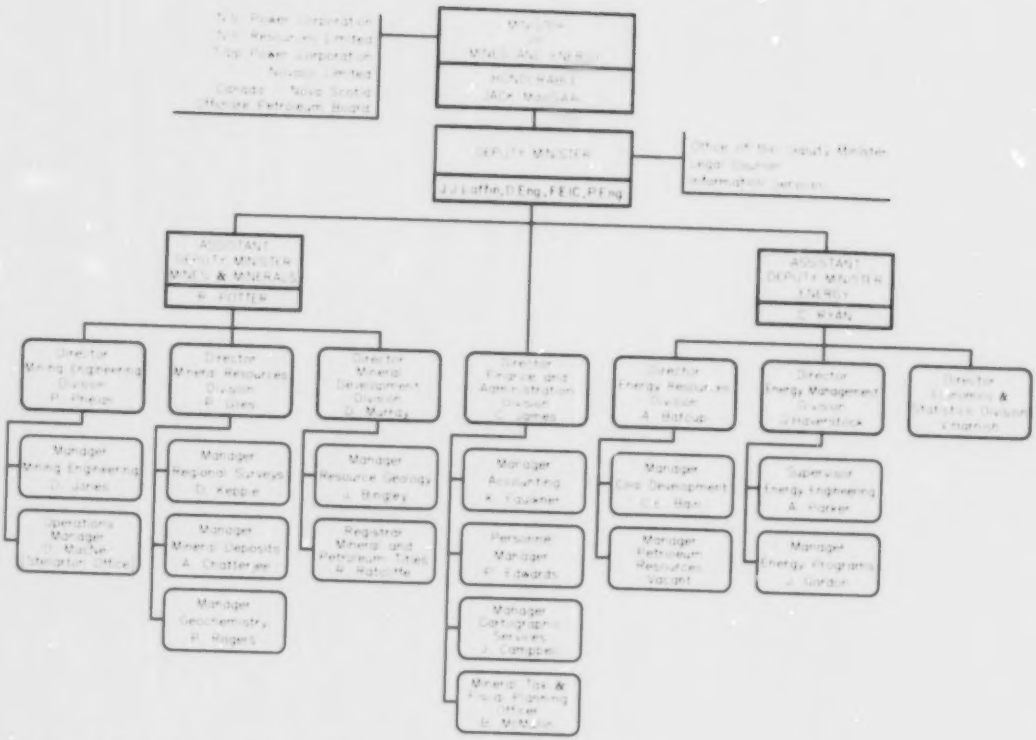


Figure 1. Organization of the Department of Mines and Energy.

ADMINISTRATION DIVISION

C. R. James, C.M.A., Director

The Administration Division provides the department with financial, operational and personnel management. It also provides cartographic and administrative services to the department and accounting services for Novaco Limited. The Director is Secretary-Treasurer of Novaco Limited and Treasurer of the Tidal Power Corporation.

Within the departmental budget, the division consists of the Offices of the Minister and Deputy Minister, Energy Branch Administration, Mines and Minerals Branch Administration and the Administration Division.

The duties and functions of the division are divided into four sections: accounting services, mineral taxation and fiscal planning, personnel and administration, and cartographic services.

The division is responsible for mineral and petroleum resource revenue policy, the collection of mineral royalties and taxes, and the management and evaluation of government-funded coal mine and coal miner assistance programs.

Accounting Services Section

Ken Faulkner, C.M.A., Section Manager

The Accounting Services Section provides managerial and financial accounting services for the department.

The section is responsible for maintaining the computerized departmental accounting system which provides managerial control by recording and reporting expenditures monthly. The Management Information System provides a monthly and year-to-date report of expenditures and comparison to the department's budget. These reports are circulated to Section and Budget Subject Managers monthly and contribute to the department's success in maintaining expenditures within budget authority. Budgeting responsibility and administration for the department are coordinated in this section by providing historical background, financial information and interpretation assistance to Budget Managers.

Two Coal Miners' Assistance Programs, the DOSCO (1923) pension and the Coal Miners' Pre-Retirement Leave Plan, are administered by this section. As of 31 March 1990, 22 former miners

were receiving the DOSCO (1923) pension and 39 were receiving Pre-Retirement Leave benefits.

Mineral Taxation and Fiscal Planning Section

Blair McMullin, Section Manager

The Mineral Taxation and Fiscal Planning Section is responsible for resource revenue policy and administration of mineral royalty and tax legislation. This section also administers the Coal Mine Investment Security Program.

The section also provides accounting services for Novaco Limited, a provincial crown corporation. During the past year the section provided support services for the establishment and maintenance of the financial management accounting system for the Canada-Nova Scotia Offshore Petroleum Board.

MINERAL ROYALTIES AND TAXES

This section proposes legislative amendments and administers the royalty and tax provisions of the Mineral Resources and Gypsum Mining Income Tax Acts.

The revenue from royalties and taxes reported by the department are shown for a 20 year period in Figure 2 and for the current fiscal year in Table 1.

Personnel and Administration Section

P. Edwards, Section Manager

This section provides advice and support on personnel management to all divisions of the department. The responsibilities of the section include recruitment, staff relations, compensation, establishment and maintenance of performance appraisal systems, career development training, personnel and payroll documentation and the maintenance of employee records. The section is also responsible for the continual upgrading of office and administrative services for the department.

The university employment program provided summer jobs for 10 students in the 1989-90 fiscal year.

In consultation with the Department of Government Services and the Civil Service Commission, work continued on a computerized Human Resource Management System (HRMS). The integration of

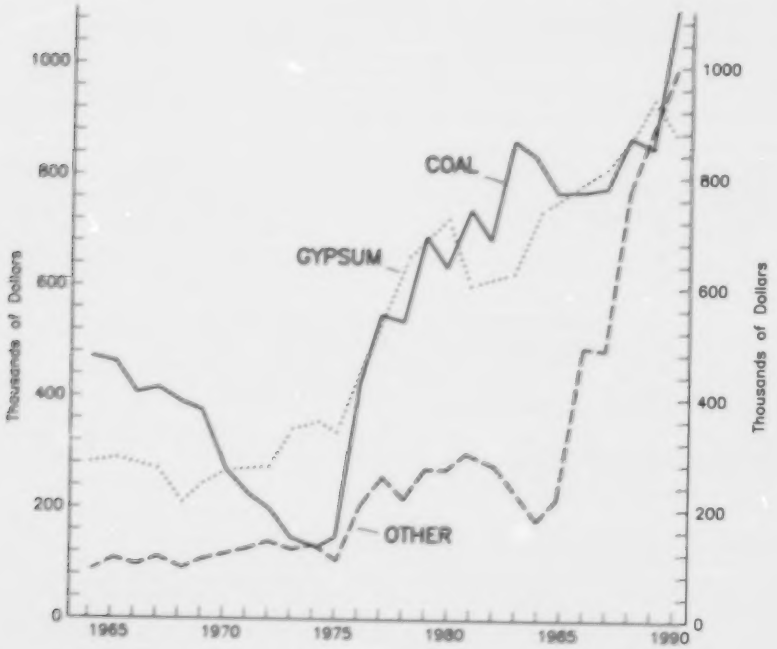


Figure 2. Historical trends of royalties and taxes.

Table 1. Royalties and taxes for the fiscal year ended 31 March 1990.

Commodity	Royalty or Tax
Gypsum	$ 877,166
Coal	1,099,494
Salt	278,266
Other	709,420
Total	2,964,346

establishment control with personnel and payroll for civil service employees was implemented. Decentralization of the input and use of civil servants' personnel data will be completed within months. Work is continuing on the implementation of an hourly payroll function for the HRMS.

The modified work week program was extended to the

Stellarton office in 1989-90. This program allows eligible employees to extend daily hours of work in exchange for time off at a later date subject to managerial approval.

The no smoking policy, which was implemented in the Founders Square office in May 1987, was also extended to the Stellarton office in 1989-90.

A multi-level departmental committee was established with the mandate to review the central registry operations and classification systems with the objective of making recommendations for changes in the service to better meet the needs of the department.

Staff attended various in-service and external courses and programs covering areas such as management and supervisory development, communication skills, clerical/secretarial development and occupational health and safety.

Cartographic Section

Joe Campbell, Section Manager

This section provides drafting and photographic services for all divisions of the department. Responsibility lies in the production of geological and energy related drawings of varied description for use in publications and visual presentations. The section also provided assistance to several other government departments during the year.

The photographic unit reproduced materials for publications, slides for audio-visual presentations and photographs for graphic displays. Field photography was carried out for several sections of the department.

FINANCIAL INFORMATION

During the 1989-90 fiscal year, the department administered expenditures of $9,833,000. Revenue derived from royalties, mining taxes, licences and fees totalled $3,250,000.

Expenditure information is presented in Table 2 under three headings: "Operations" and "Assistance" are budgeted in the department. "Other" includes expenditures budgeted under the Department of Industry, Trade and Technology.

Operations information is presented by budget subject title by division. Assistance information is presented by budget subject title under two sectors: "Mining Industry" and "Energy". Other information is presented by the legislative vote title or the department where the funds have been budgeted.

As the expenditure information provided was drawn from the publications: *Estimates of the Government of Nova Scotia* and *Public Accounts of the Province of Nova Scotia*, the subject titles may differ from the sectional titles drawn from the department organization chart.

Table 2. Financial information about the Department of Mines and Energy.

OPERATIONS

Division Activity Budget Subject Title	Actual Expenditure 1988-89	Estimate 1989-90	Final Forecast 1989-90
ADMINISTRATION DIVISION			
1. Office of the Minister and Deputy Minister	$ 451,035	$ 459,500	$ 437,600
2. Accounting, Personnel and Administration	574,505	699,000	634,600
3. Cartographic Services	339,848	346,900	357,900
4. Energy Branch Administration	444,471	499,700	525,800
5. Mines and Minerals Branch Administation	474,513	464,200	479,300
Total Administration Division	$2,284,372	$2,469,300	$2,435,200
ECONOMICS AND STATISTICS DIVISION	$ 375,032	$ 401,300	$ 364,100
ENERGY MANAGEMENT DIVISION			
1. Provincial Energy Analysis	$ 326,408	$ 322,900	$ 347,800
2. Energy Advisory Services	473,452	472,200	475,700
3. Energy Engineering	240,355	330,000	320,300
4. National Conservation and Alternative Energy Initiatives	368,538	---	---
5. Energy, Efficiency and Diversity Program	---	202,200	149,000
Total Energy Management Division	$1,408,753	$1,327,300	$1,292,800
ENERGY RESOURCES DIVISION			
1. Petroleum Resources	$ 571,691	$ 548,500	$ 491,400
2. Coal Exploration	297,989	305,600	309,700
3. Coal Development and Utilization	179,880	196,900	207,500
Total Energy Resources Division	$1,049,560	$1,051,000	$1,008,600
DRILL AND MECHANICAL DIVISION			
1. Drilling Services	$ 616,574	$ 350,400	$ 351,800
2. Operations & Maintenance	348,731	322,300	350,700
Total Drill and Mechanical Division	$ 965,305	$ 672,700	$702,500
MINING ENGINEERING DIVISION	233,810	234,100	$251,200
MINERAL RESOURCES DIVISION			
1. Mineral Resource Evaluation	$ 236,614	$ 250,300	$285,800
2. Regional Surveys	331,797	327,700	351,300
Total Mineral Resources Division	$ 568,411	$ 578,000	$637,100

Table 2. (continued)

MINERAL DEVELOPMENT DIVISION			
1. Resource Geology	$ 156,087	$ 152,900	$160,500
2. Regional Exploration Services	223,389	230,800	240,500
3. Library Services	188,897	206,100	205,600
4. Mineral & Petroleum Titles	129,612	149,500	174,900
Total Mineral Development Division	**697,985**	**739,300**	**$781,500**
TOTAL OPERATIONS	**7,583,228**	**7,473,000**	**$7,473,000**

ASSISTANCE PROGRAMS Budget Subject Title	Actual Expenditure 1988-89	Estimate 1989-90	Final Forecast 1989-90
MINING INDUSTRY ASSISTANCE			
1. Coal Miners' Assistance	$ 339,631	$ 370,000	$300,000
2. Coal Development - Novaco	25,000	25,000	25,000
3. Coal Mines Investment Security Program	83,325	106,000	55,000
4. Abandoned Mine Site Reclamation	16,895	10,000	10,000
5. Glace Bay Miners Work Program	250,000	---	---
6. Coal Research & Development	---	250,000	250,000
Total Mining Industry Assistance	**$ 714,851**	**$ 761,000**	**$640,000**
ENERGY ASSISTANCE			
1. Coal Liquefaction	$ 249,065	---	---
2. Oil Substitution	2,191,685	---	---
3. Wood Energy Conversion Studies	20,967	65,000	20,000
Total Energy Assistance	**2,461,717**	**65,000**	**20,000**
TOTAL ASSISTANCE	**3,176,568**	**826,000**	**660,000**

OTHER PROGRAMS Budget Subject Title	Actual Expenditure 1988-89	Estimate 1989-90	Final Forecast 1989-90
OTHER (Budgeted in Dept. of Industry, Trade & Technology)			
1. Mineral Development Subsidiary Agreement	3,756,782	396,200	300,000
2. Mineral Development Program III	---	3,000,000	1,400,000
3. Energy Biomass Program	---	600,000	---
TOTAL OTHER	**3,756,782**	**3,996,400**	**1,700,000**
TOTAL EXPENDITURES ADMINISTERED BY DEPARTMENT OF MINES AND ENERGY	**14,516,578**	**12,295,400**	**9,833,000**

LEGISLATION

INTRODUCTION

The Nova Scotia Department of Mines and Energy receives its mandate from the Public Service Act. This Act provides for a Department of Mines and Energy and the appointment of a Deputy Minister. It also provides for the function of the department and its employees.

The following Acts are administered by the Department of Mines and Energy:

Mineral Resources Act R.S.N.S. 1989, c.286.

The Mineral Resources Act governs the administration, ownership and disposition of mineral rights. It also provides for resource management requirements and royalties.

Treasure Trove Act R.S.N.S. 1989, c.477.

The Treasure Trove Act regulates the exploration for precious stones and metals in a state other than their natural state. Forms for exploration and royalties are provided by Order of the Governor in Council.

Coal Mines Regulation Act R.S.N.S. 1989, c.73.

The Coal Mines Regulation Act governs operation and safety in provincial coal mines. Coal mines operated by the Federal Government through Crown corporations, such as the Cape Breton Development Corporation, are inspected and regulated under the Canada Labour Code. Provincial coal mines are inspected by the Nova Scotia Department of Labour.

Gas Storage Exploration Act R.S.N.S. 1989, c.181.

The Gas Storage Exploration Act governs exploration and development of underground storage of liquid or gaseous petroleum products.

Metalliferous Mines and Quarries Regulation Act R.S.N.S. 1989, c.284.

The Metalliferous Mines and Quarries Regulation Act governs

operation and safety in mines and quarries that are not otherwise covered by the Coal Mines Regulation act. Quarries operated by the Department of Transportation do not fall under this Act. Inspections are performed by Nova Scotia Department of Labour.

Gypsum Mining Income Tax Act R.S.N.S. 1989, c.190.

The Gypsum Mining Income Tax Act provides for reporting procedures and mining tax formulae for gypsum mining operations in the province.

An Act to Confer Certain Powers Upon the Lieutenant Governor in Council and to Amend the Mines Act S.N.S. 1918, c.16.

Certain powers are conferred on the Lieutenant Governor in Council for the purpose of maintaining an acceptable level of stability in the coal mining industry. The Act provides authority for an assistance program for independent coal mine operators, a pre-retirement leave program and operation of Novaco.

Petroleum Resources Act R.S.N.S. 1989, c.342.

The Petroleum Resources Act regulates the administration and distribution of petroleum rights in Nova Scotia.

Energy and Mineral Resources Conservation Act R.S.N.S. 1989, c.147.

The Energy and Mineral Resources Conservation Act provides authority to establish an Energy Board to hear matters arising out of such Acts as the Gas Utilities Act, Pipeline Act, etc.

Gas Utilities Act R.S.N.S. 1989, c.182.

The Gas Utilities Act regulates the process wherein an applicant may seek and obtain approval to operate a gas utility. By amendment (S.N.S. 1984, c.61) the Act may be limited to certain geographic areas and certain operations.

Pipeline Act R.S.N.S. 1989, c.345.

The Pipeline Act regulates all aspects of transmission of oil and gas. The Act may be limited to certain transmission lines and certain geographic areas as provided for in S.N.S. 1984, c.65.

Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act S.N.S. 1987, c.3.

Offshore Petroleum Royalties Act S.N.S. 1987, c.9

An Act to Protect Georges Bank S.N.S. 1988, c.56.

The above noted legislation, in conjunction with the corresponding federal mirroring legislation, provide the regulatory framework for offshore oil and gas management.

ENERGY MANAGEMENT DIVISION

Greg Haverstock, P.Eng., Director

INTRODUCTION

The Energy Management Division has three primary responsibilities. The division:

- evaluates, analyzes and contributes to policies and technologies affecting energy supply and demand,
- implements energy efficiency and conservation programs, fuel substitution programs, and renewable and indigenous energy resource programs, and
- provides programs that increase public awareness of energy efficiency and conservation opportunities, energy supply options, and provincial energy policies, plans and programs.

ORGANIZATION

The division is composed of two sections: Energy Programs and Energy Engineering. The Energy Programs Section includes: the Provincial Energy Analysis Program, which delivers energy analysis and follow-up programs to the public and industrial/commercial sectors; Residential Energy Programs, which provides energy conservation services and project management to the residential and transportation sectors; and the Energy Education Program, which provides educational information on energy to students and educators. The Energy Engineering Section plans, manages and evaluates technical studies, and energy efficiency and renewable energy projects.

SIGNIFICANT EVENTS

The department funded, and division staff participated in, nine cost-shared energy efficiency and renewable energy initiatives during the 1989-90 fiscal year with other governments and with the private sector. Project co-sponsors included Energy, Mines and Resources Canada, the City of Halifax, the Dartmouth Housing Authority, the Lunenburg Home for Special Care, Maple Leaf Technologies Limited and ThermoDynamics Limited. A conference and workshop, "Residential Oil Heating in the 1990s", organized by staff attracted

more than 100 representatives of the oil heating industry. The cost-shared projects had a total value of $523,475 with the department's share approximately $105,000.

Staff took a lead role on behalf of the other provinces and territories to secure funding for background work required to enable updating of the 1983 *Measures for Energy Conservation in New Buildings*, published by the Associate Committee on the National Building Code.

Division staff also represented the department on a number of local and national committees dealing with energy issues of concern to the province.

Energy Programs Section

Jim Gordon, Manager

INTRODUCTION

The goal of the Energy Programs Section is to promote the efficient and appropriate use of energy. This is achieved through the provision of various conservation and fuel substitution programs to all sectors.

Three main working groups constitute the Energy Programs Section: the Provincial Energy Analysis Program (P.E.A.P.), Residential Energy Programs, and the Energy Education Program.

RESIDENTIAL ENERGY PROGRAMS

The Residential Energy Programs staff operate information programs and demonstration projects that address significant residential and transportation energy management issues.

The Enerinfo line (1-424-5727), a province-wide toll-free energy advisory service, received 2333 requests for information during the 1989-90 fiscal year. More than 1100 written information requests were received as a result of the Enerinfo Display at home and energy trade shows, and other information initiatives. Information was provided on topics such as insulation, heating systems, draftproofing, ventilation and moisture, energy efficient house construction and vehicle fuel economy. Loans of videotapes on energy-related subjects totalled 941.

Staff also performed 58 building inspections followed by reports and recommendations to address problems and improve building energy efficiency. Eight articles on residential conservation were provided to the media and a staff member appeared regularly on a CBC radio phone-in show as guest expert on residential energy issues.

Publications produced in the 1989-90 fiscal year included *Hot Water Answers*, a booklet of domestic hot water energy saving tips, *Enerinfo Video Library*, a brochure on the energy conservation videotapes available, and five *Enerinfo Adviser* fact sheets on ventilation, airtightness and moisture. Funding was also provided for production of a video program on condensation and ventilation.

Evening seminars on four home and energy topics were given by staff in cooperation with local community organizations. A total of 41 seminars were given to 596 attendees. Staff also made presentations at six other seminars. Advice was provided to the provincial departments of Consumer Affairs, Municipal Affairs and Housing, as well as to the Nova Scotia Power Corporation and other organizations and community groups on residential energy issues.

Staff also coordinated the department's participation with Prince Edward Island and Energy, Mines and Resources Canada in the Pro-Trucker Fuel Efficiency Project. During the 1989-90 fiscal year, 12 seminars on fuel efficiency in the trucking industry were given in Nova Scotia to 258 individuals by the Commercial Safety College, Masstown, N. S., on behalf of the project's sponsors.

Staff represented the department on numerous organizations and committees including: the Canadian Wood Energy Institute, R-2000 Home Program Regional Marketing Committee, Nova Scotia Chapter of Society, Environment and Energy Development Studies (S.E.E.D.S.), the Canadian General Standards Board's National Advisory Panel on Standards for Building Performance and the Canadian Standards Association's Working Group for a Through the Wall Venting Standard.

ENERGY AWARDS

Staff administered the Nova Scotia Energy Awards Program to recognize outstanding contributions to energy management and fuel substitution. The 1989 winners were:

Large Manufacturing and Processing Companies

Crossley Carpet Mills Ltd., Truro, N. S.

- A new yarn dryer provided annual energy savings of about $55,000.

Government and Institutions

Cape Breton Joint Expenditure Board, Sydney, N. S.

- A program trained unemployed workers and draftproofed more than 200 homes in Cape Breton County.

Halifax District School Board

- Energy management systems installed in five schools produced annual energy savings of about $92,000.

Organizations, Community Groups and Individuals

Vaughn Munroe, Ottawa

- Mr. Munroe promoted renewable energy and energy management on both a personal and professional level in Nova Scotia over a 15 year period.

Town of Springhill Geothermal Committee

- The committee was instrumental in the development of geothermal energy from warm water in abandoned mines beneath the town.

Alternative Energy

Ropak Can-Am Limited, Springhill, N. S.

- The company installed a heat pump system that uses geothermal energy for space heating and cooling.

Energy Award 1989 Honourable Mentions were awarded to Camp Hill Medical Centre, Halifax, and George Russell, Halifax.

ENERGY EDUCATION PROGRAM

The primary focus of the Energy Education Program has been in-class presentations to elementary and junior high students to create an awareness of efficient energy use and appropriate fuel substitution.

Student and teacher resource materials are also prepared and distributed.

During the 1989-90 fiscal year, staff made 446 presentations to 29,998 students in 143 schools. New student activity sheets and a new presentation were developed for the elementary level.

Staff coordinated the update and printing of the *1989 Canadian Energy Education Directory* on behalf of all provinces. A resource book entitled *Nova Scotia Energy Resources* was made available to all junior and senior high schools.

PROVINCIAL ENERGY ANALYSIS PROGRAM

The Provincial Energy Analysis Program (P.E.A.P.) provides on-site, computer-based energy analyses to provincial and municipal government facilities as well as detailed technical information on the implementation of measures for energy efficiency improvements. P.E.A.P. also shares the responsibility of energy analyses for large industrial energy users with Energy Engineering Section staff, and provides preliminary investigation of retrofit opportunities for small industries and commercial facilities on request.

During the 1989-90 fiscal year, 76 energy analyses were conducted in buildings with a combined annual energy bill of $7.47 million. Energy efficiency improvements that could reduce annual energy costs by $798,000 or 10.7% were identified in these buildings.

Staff assisted a number of government clients with the costing and planning of energy efficiency improvements. These clients included Gillis High School, Antigonish; Richmond, Inverness and Clare/Argyle School Boards; Aberdeen Hospital, New Glasgow; South Cumberland Memorial Hospital, Parrsboro; and the Nova Scotia Hospital, Dartmouth.

Services provided included evaluation of equipment options and assistance with preparation of specifications for projects such as energy management systems, and upgrading or replacement of lighting and heating systems.

A new program "Energy Analysis Program for Industry and Commerce", was inaugurated in the 1989-90 fiscal year to provide detailed energy analyses to industrial sites with energy bills of more than $150,000 per annum.

Detailed reports were provided to eight companies, with savings of more than $275,000 identified. The majority of measures recommended had an average simple payback of two years or less. Two site evaluations were underway at fiscal year end. A further 10 sites have requested the service.

P.E.A.P. staff coordinated the demonstration and monitoring of AirWatt heat pumps at two sites, Harbour View Haven, Lunenburg, and Nantucket Place, Dartmouth, both senior citizens' residences. Staff also managed a project at St. Mary's University and Dalhousie University to monitor the performance of an EMS-4000 domestic hot water controller.

A manual containing presentation material from the Building Operator Training Course was completed in cooperation with the Department of Government Services and work started on curriculum for a new course in May 1990. Discussions were held with Advanced Education and Job Training regarding use of course material in community colleges. Staff also assisted the Technical University of Nova Scotia with planning and organization of seminars on "Boiler Performance" and "Rehabilitation of Buildings".

Energy Engineering Section

A. Parker, P. Eng., Manager

INTRODUCTION

The Energy Engineering Section is responsible for the planning, management, implementation and evaluation of studies and projects related to energy management, fuel utilization and substitution, energy transmission and distribution, and renewable energy resources. The section also provides engineering assistance on work being carried out by the Energy Programs Section and participates in long range planning and policy development.

ACTIVITIES

Engineering staff participated in several projects cost-shared with other parties. These included a demonstration of 18 residential and three light commercial wood-pellet burning appliances in Cape Breton, and an energy-efficient lighting retrofit demonstration at the Halifax Library and the St. Andrew's Recreation Centre offices in Halifax. The department also cost-shared the installation of 100

residential solar domestic hot water systems, each with its own monitoring equipment, to evaluate annual and seasonal performance.

Following budget reductions in the Tidal Power Corporation, staff were assigned responsibility for professional, technical and administrative support to the corporation. Three studies were initiated or continued during 1989-90. Two of these were related to fish mortality at the Annapolis Tidal Generating Plant. A count was completed of the number, sex and age group of American shad returning to the Annapolis River to spawn, and the design and installation of sound-producing fish diversion devices were carried out at the Tidal Plant site.

The third study, in which the Tidal Power Corporation was a participant with Energy, Mines and Resources Canada, and Environment Canada, involved data collection and mathematical modelling of sediment movement and buildup at the proposed Tidal Power Site A8. Data collection is complete and the modelling phase will be completed during late 1990.

Staff provided preliminary technical and financial analysis for three applicants to the Wood Energy Feasibility Analysis Program during the year. One of these resulted in financial assistance for a detailed analysis by a consulting engineer.

Increased concern about the environmental implications (primarily greenhouse gases) of energy use led to the formation of a federal/provincial Energy Ministers' Task Force to investigate the issues involved and develop a strategy to approach the problem. The Energy Engineering Section participated in the evaluation of Task Force studies, the development of a provincial carbon dioxide emission inventory and presentations to groups with vested interests in this area.

Engineering Section staff continued to share responsibility to provide the Energy Analysis Program for Industry and Commerce, as well as detailed analysis needed to develop a variable speed drive demonstration project at Crossley Carpets Ltd. in Truro.

Staff also worked on the development of estimates of potential energy savings available through energy efficiency in the residential and institutional sectors, and assisted with the organization of the Solar Energy Society of Canada's national conference in Halifax, 18-20 June 1990.

Engineering staff continued to provide technical expertise and computer programming to assist the residential programs group and to monitor technology developments that could affect energy production and use in Nova Scotia. Specific topics of interest include biomass and coal combustion, solar domestic water heating, photovoltaic and wind energy systems, and ground source heat pumps.

ECONOMICS AND STATISTICS DIVISION

Vicki Harnish, Director

INTRODUCTION

The Economics and Statistics Division was established in 1987-88. It has four primary responsibilities. These include:

- coordination of overall provincial energy planning activities;
- provision of economic analysis, and statistical and computer support services for the Energy Branch;
- provision of policy advice on matters related to energy pricing, markets, transmission, resource procurement and availability; and
- making known the province's position on these matters to other levels of government and the private sector.

The division prepares reports, position papers and publications, and manages the preparation of studies by private consultants. Depending on the nature of the material, these studies are made available to other departments, the public, energy corporations and other governments and agencies. The division also develops computer models for use within the branch.

The division comprises two sections: Economic Analysis, and Statistics and Computer Services.

Economic Analysis Section

The Economic Analysis Section is primarily responsible for overall energy planning, program evaluation, economic analysis and energy market monitoring. These responsibilities require the development of policy alternatives for senior department officials, the selection and use of appropriate analytical techniques, direct and indirect participation in regulatory proceedings, and the occasional development of draft legislation.

ACTIVITIES

The activities of the section were dominated by organizing the 9th Northeast International Committee on Energy Roundtable held in Halifax in April 1990. Considerable staff time and effort were put into planning and hosting this year's roundtable, which attracted over 200 participants. The topic of the roundtable was "Northeast Electricity Issues".

The evaluation of programs, activities and policies remained a major task for the division during the year. This involves using both economic impact and cost-benefit analysis techniques in order to identify and quantify the various economic benefits that flow to Nova Scotians from various energy-related undertakings. Ongoing and completed projects of this nature undertaken in the past year included evaluations of the economic impacts created by wood energy projects and an update of the report *Economic Impacts of Coal Mining in Nova Scotia.*

As the impact of energy development and use on the environment captures greater public attention, the division has directed more resources to this area of study. The most demanding work of this nature involved participation on a multi-division committee developing Nova Scotia's position for the report of the Energy Ministers' Task Force on Energy and the Environment issued in April 1990. Additional work in this area included follow-up on the Environment and Economy Sub-committee established last year, a review of environmental impact assessment procedures necessary for approval of energy projects in Nova Scotia, and participating on a Steering Committee organizing the Voluntary Planning/Department of Environment sponsored Environment/Economy Conference.

Division personnel assisted the Department of Consumer Affairs in an assessment of the impact in Nova Scotia of Imperial Oil's takeover of Texaco Canada assets. A description of the provincial wholesale and retail petroleum product market was also completed by the section.

Section staff represented the department on international and interprovincial committees related to energy. A staff member served on the Energy Emergency Planning Sub-committee of the Northeast International Committee on Energy and on the Interprovincial Advisory Committee on Energy Demand Restraint Sub-committee.

Other related duties performed during the year included a weekly survey of retail gasoline prices in Halifax - Dartmouth, the development of a model that forecasts the energy use for road transportation, and an assessment of the impact of the goods and services tax (GST) on energy products in Nova Scotia.

Statistics and Computer Services Section

The Statistics and Computer Services Section is responsible for energy database development and maintenance, analysis and dissemination of statistics and the provision of forecasts of energy demand and prices. The section's other major responsibility is provision of computer programming services, and software and hardware support to the branch. Technical advice on computer equipment selection and the development of in-house programs are included in this activity.

ACTIVITIES

A major focus of section activity during the past year was the completion of the 20 year forecast of energy demand and prices in Nova Scotia. The forecast incorporates new data and economic trends that have developed since the 1985 forecast. The results have already been used in conjunction with the Energy Ministers' Task Force on Energy and the Environment to determine future carbon dioxide emission levels in the province and have also been used in an assessment of the potential savings from various energy conservation measures that may be undertaken in specific sectors of the Nova Scotia economy. It is expected that this forecast will now be updated annually.

Considerable effort was directed toward creating new databases and expanding, upgrading and updating various existing databases used by the division to carry out its day to day activities. The main area of activity was improvement of the province's data on coal production and sales.

With the rapid changes in computer technology and software taking place in the market, section staff have played a key role in the development of a Long Range System Plan for computer systems in the Energy Branch and the department. Within the division, a number of upgraded software packages were introduced and one system was added to the department's local area network.

Ongoing duties of a statistical nature include the monthly

publication of an information sheet on energy supply, demand and prices in the province. This report contains a section on leading economic indicators for the province as well as any recent economic developments that may have an impact on the Nova Scotia economy.

The section provided computer programming and data entry support to staff administering the Provincial Energy Analysis Program. Data collected by Energy Management staff from approximately 77 buildings were added to the database. As well, an additional year's data were added to the Energy Accounting System. This system is in place to monitor energy use in 300 government and institutional establishments in Nova Scotia to determine changes in energy use patterns over time.

ENERGY RESOURCES DIVISION

A. G. Batcup, P. Eng., Director

INTRODUCTION

The Energy Resources Division is accountable for the evaluation, promotion and regulation of Nova Scotia's energy resources. The division's activities are primarily concerned with the two main hydrocarbon resource sectors, coal and petroleum (oil and gas).

MAJOR EVENTS AND ACTIVITIES

For the coal section, the key issue to emerge during the past year was public concern about global warming, otherwise known as the greenhouse effect. Staff represented the province on the Canadian Energy Ministers' Task Force set up to examine the issue, consulted with Nova Scotian stakeholders, and helped prepare a report for the Energy Ministers by April 1990. In a related field, section personnel were instrumental in establishing a Committee on Atlantic Coal Research and Development Agreement described below and involving annual expenditures of $750,000. Many of the programs under the Agreement, which are all administered by section staff, are concerned with reducing emissions through new or more efficient coal combustion technologies. The section's coal geologists continued their cooperative work with old, new and potential coal producers such as Cape Breton Development Corporation (CBDC), Westray and Esso. Esso spent $737,000 during the period exploring for coal in the Springhill area.

For the petroleum section, the major event of the year occurred on 21 December 1989 when a consortium of LASMO Nova Scotia Limited (LASMO) and Nova Scotia Resources (Ventures) Limited (NSRL) submitted a plan to develop the Cohasset and Panuke offshore oil fields for regulatory approval. This event was preceded on 30 June 1989 by a successful exploration land sale where nearly $20 million in work expenditures were bid for three parcels of offshore acreage. The Canada-Nova Scotia Offshore Accord legislation was proclaimed on 5 January 1990 and a new Canada-Nova Scotia Offshore Petroleum Board was established. Petroleum section activity associated with these events included a technical review of the Cohasset/Panuke development plan on behalf of the Minister, royalty negotiations with LASMO, and redoubled efforts to finalize the numerous sets of technical regulations associated with the Accord legislation.

Coal Section

C. E. Bain, P. Eng., Manager

INTRODUCTION

The role of the Coal Section is to explore, evaluate and promote the development and use of coal resources in Nova Scotia in an environmentally responsible manner. The Coal Section comprises two groups: Coal Geology and Coal Utilization.

The mission of the Coal Geology Group is to assess the Nova Scotia coalfields to determine the availability, quantity and quality of underground and surface deposits. The mission of the Coal Utilization Group is to coordinate the development and efficient use of coal and coal products and to examine all new technical developments relating to coal utilization for applicability to Nova Scotia coals.

COAL UTILIZATION

Programs and Policy

To keep abreast of new policy directions and technology advances, the Coal Utilization Group participates in numerous committees. This enables the province to participate in shared projects and to have input into future policy affecting the coal industry.

Development and Utilization

The future of coal, which is the province's most important energy resource, will depend on the development of advanced technologies for using coal and on the implementation of optimum mining, processing, handling and transportation systems. The Coal Utilization Group's emphasis is on technologies for coal-fired power generation that address the environmental concerns of acid rain and the greenhouse effect. The section works closely with Cape Breton Development Corporation, Nova Scotia Power Corporation and the Nova Scotia Department of the Environment regarding sulphur dioxide, nitrogen oxides and carbon dioxide emissions. In addition the section evaluates proposals and monitors programs and technologies such as gasification, liquefaction and co-processing that produce synthetic fuels from coal. On an ongoing basis the Coal Section analyzes opportunities and barriers associated with expanded coal utilization.

Coal Research Agreement

In 1989 the Department of Mines and Energy, Cape Breton Development Corporation and Nova Scotia Power Corporation (NSPC) signed a Coal Research Agreement. This agreement provides for a joint industry-government fund for coal research and development under the auspices of the Committee on Atlantic Coal (CAC). Contributions to the fund totalled over $480,000 in the 1989-90 fiscal year. In addition to this, NSDME has an ongoing commitment from Energy, Mines and Resources Canada for the federal expenditure of at least $250,000 per year on projects identified by the CAC. The Coal Section coordinates coal research and development for the province and, under the Research Agreement, the province administers the Research Agreement program and funds.

Coal Research, Development and Demonstration (R, D & D)

Major R, D & D activities during the 1989-90 fiscal year included:

- integrated coal gasification combined cycle (IGCC): computer simulation of process performance by key coal gasification process developers with three Nova Scotia coals; engineering and economic assessment of an IGCC power generating unit at Point Aconi; testing of Prince Mine coal in a bench scale coal gasifier.

- co-processing of coal and heavy oil: a technical and economic feasibility study of a commercial co-processing plant at Point Tupper to produce liquid transportation fuels.

- coal liquefaction: laboratory tests of catalysts and catalyst regeneration to improve overall process performance of two stage liquefaction with Nova Scotia coal.

- energy and the greenhouse effect: a perspective on the greenhouse effect including the effect of methane and carbon dioxide emissions on atmospheric change, analysis of emissions by sector and region, and assessment of control options.

- explosiveness of air/methane/coal dust: a laboratory evaluation of the relative explosiveness of mixtures of Cape Breton coal dust with methane and air in various

concentrations.

- fluidized bed combustion: testing of limestone pretreatment to enhance sulphur capture; continuing assessment of circulating fluidized bed technology.

The Coal Utilization Group is responsible for determining research and development requirements in Nova Scotia, securing funds, coordinating the industry-government program, requesting and/or reviewing proposals, overseeing projects, and evaluating and distributing technical information.

COAL GEOLOGY

Sydney Coalfield

In cooperation with the Cape Breton Development Corporation (CBDC) Geology Department, the section has initiated a detailed study of the sedimentology of a lacustrine sequence that locally overlies the Harbour Seam. Observations by CBDC geologists and others have indicated that lacustrine roof sequences correlate with areas of reduced seam thickness as well as with changes in coal quality. The purpose of this phase of the study is to determine controls the lacustrine systems exerted on the deposition and development of the Harbour Seam in the Donkin Resource Block.

Reconstruction of the depositional history of the Harbour Seam and roof strata in this area can help develop predictive tools for determining changes in roof conditions, seam thickness and coal quality in underground mining. Ongoing work includes completion of logging of roof sequences to produce a detailed roof stratigraphy, organic petrography of selected seam sections, and coal geochemistry.

Debert-Kemptown Coalfield

Regional 1:10 000 scale mapping of the Debert-Kemptown coalfield continued intermittently during the 1989-90 fiscal year. Emphasis was placed on determining the age and stratigraphic position of the various coal-bearing sequences within the coalfield. Two coal-bearing sequences have been recognized: (1) an upper sequence which contains the relatively well-developed coals of the Debert River area and (2) a stratigraphically lower sequence which includes the thin coal seams outcropping on West Branch North River, Coal Mine Brook and possibly along the Salmon River near Kemptown.

The upper coal-bearing sequence has a mid Westphalian C age and is, therefore, a partial age equivalent of coal measures in the Stellarton Basin. The lower coal-bearing unit is Westphalian B age, similar to coal of the Springhill coalfield.

The structurally complex nature of the basin precludes developing an accurate stratigraphic model until further structural mapping is complete. Open file maps (1:10 000 scale) of the coalfield will be updated as further work is completed.

Pictou Coalfield

In the Pictou coalfield, a study of structural patterns has been completed. A report, along with a structural map of the basin, is nearing completion and will be placed on open file in 1990. The work on structural patterns was undertaken to provide general information on fold and fault trends within the Pictou coalfield. Results of the study will be of benefit to the proposed mine on the Foord Seam by Westray Coal.

West Coast Cape Breton Coalfields

Paper 89-3, entitled *Re-evaluation of the Coal Resources of Western Cape Breton Island*, was published by the department and is available through the department's Library. The paper is a summary of geological investigations that took place between 1966 and 1985 on the four coalfields located on the western coast of Cape Breton Island. Included in the paper are coal resource estimates for the respective coalfields. Palynological analysis of the coal-bearing coastal sections of Port Hood and Chimney Corner coalfields was undertaken on behalf of the department by consultant Graham Dolby during 1989. He reports a mid Westphalian A age for both sections and correlates them with the upper half of his zone 2 in the Joggins section.

Cumberland Basin Coalfields

Studies of the nature of coal in the Cumberland Basin, with emphasis on the thicker coal seams containing lower sulphur in the Springhill coalfield, continued during the 1989-90 fiscal year, with two papers submitted to international special publications of the Geological Societies of America and France. The correlation of coal-bearing sequences throughout the basin was facilitated through continuing palynological analysis. Data procured confirm the correlation of coal intersected at depth in drillhole SA.88.2 at South Athol with seams of

the Springhill coalfield. Coal at Joggins was studied for its potential as an oil source rock.

Open File Map 90-002, scale 1:50 000, incorporating the Joggins and Springhill coalfields was co-authored by geologists of the Mineral Resources and Energy Resources Divisions. A 1:100 000 scale map of the same area is being prepared for publication in the 1990-91 fiscal year.

Esso Resources Canada Ltd.'s coal exploration activities in the Springhill coalfield are described in Appendix B.

Coal Geology Database

Work continued in 1989-90 on development of a computer database of geological and coal quality data for Nova Scotia. This project is implemented by the Geological Survey of Canada, Institute of Sedimentary and Petroleum Geology, in cooperation with the Department of Mines and Energy.

During 1989-90, further data entry continued for the Pictou coalfield. As well, entry was completed for more than 4000 channel samples from the underground mines in the Sydney coalfield.

Work is continuing on development of a computer model of the Sydney coalfield. This is an iterative process, with new sets of maps being generated and checked until an acceptable correlation framework is created. Work is continuing on refinement of the Sydney coalfield model.

Oil Shale Resources Project

A final report to the provincially-funded 1984-89 Canada-Nova Scotia Mineral Development Agreement (CNSMDA) Oil Shale Project was completed and submitted for review early in 1989. The report, which summarizes the geology, composition and oil yield potential of the province's oil shale resources will be available as NSDME Economic Geology Series 90-3, *Oil Shale Resources of Nova Scotia*, by summer 1990.

In addition to the final report, a paper describing the Stellarton oil shales and their resource potential was prepared and presented at the 22nd Annual Oil Shale Symposium in Colorado in April 1989. The paper was subsequently published in the Symposium Proceedings

volume. As well, another paper detailing the characteristics of high grade Stellarton oil shale was published in the February 1990 volume of the journal Fuel.

Metals and Petrographic Characterization of Nova Scotia Coals Project

This project, proposed for provincial funding under a new federal-provincial agreement on mineral development, is aimed at compilation, generation and interpretation of primary data on mineral matter (including major, minor and trace elements), petrographic character and variability of Nova Scotia coals. Work on this project is integrated with ongoing studies of Nova Scotia coalfields by section staff and federal staff at the Institute of Sedimentary and Petroleum Geology, Calgary. In the 1989-90 fiscal year, project activity included project planning, compilation of currently existing and available coal geochemistry and petrography data, and initial description, sampling and analyses of some of the major economic seams. A preliminary project report appears in NSDME Report 89-3.

Petroleum Resources Section

C. A. Parker, P. Eng., Manager

INTRODUCTION

The Petroleum Resources Section is responsible for administering all aspects of Nova Scotia's petroleum resources onshore. Since 5 January 1990, when the Offshore Accord legislation was proclaimed, the Canada-Nova Scotia Offshore Petroleum Board has been responsible for the day-to-day regulation of offshore petroleum activities. The Petroleum Resources section works closely with the board. The section's primary role is to advise the Minister with respect to the powers that the legislation has given him, such as the sole right of approval of Part 1 of Project Development Plans and joint approval with the federal Minister of most other fundamental decisions. The section remains responsible for the development of provincial policy, legislation and regulations, monitoring and evaluating petroleum resources, advising provincial officials, and promoting the province's petroleum resources onshore and offshore.

Several significant events occurred in the 1989-90 fiscal year. Section activity associated with these events included the following:

- staff began the evaluation of a development plan for

the Cohasset and Panuke offshore oil fields submitted in December 1989 by LASMO Nova Scotia Limited and Nova Scotia Resources Limited (NSRL);

- regulations were developed for the offshore pursuant to implementation of the Accord legislation;
- a call for proposals for petroleum exploration rights on three parcels of offshore acreage was issued by the Canada-Nova Scotia Offshore Oil and Gas Board on the recommendation of the section. Work expenditure bids of almost $20 million were received and all three parcels were awarded;
- following industry nominations, a new call for bids on another parcel of land will close on 5 July 1990;
- a number of analyses of various potential onshore and offshore fields were completed by the section as part of a promotional effort;
- section staff were involved in the analysis and negotiation of royalty terms, which will apply to the Cohasset/Panuke project, and the regulations that govern their application;
- section staff were directly involved in the issuance of onshore petroleum rights, and inspection and monitoring of the drilling of an onshore well; and
- staff participated in several industry-government Canadian Standards Association committees on oil and gas concerns.

OFFSHORE EXPLORATION AND DEVELOPMENT ACTIVITY

No wells were drilled offshore during the 1989-90 fiscal year.

A 2-D geophysical program was conducted during October-November 1989 in the Cohasset/Panuke area by LASMO Nova Scotia Limited and Nova Scotia Resources Limited. This consortium also made initial plans to carry out a 3-D geophysical survey over the Panuke field in May 1990.

Site surveys and shallow core studies of the proposed

development sites and subsea pipeline routing between Cohasset and Panuke will be undertaken in April 1990.

Active Exploration Agreements (E.A.s) and Call for Proposals

The Call for Proposals 89NS-1, which closed on 30 June 1989, resulted in the addition of three new exploration agreements (E.A.s) (Fig. 3). Each of the new E.A.s require that a well be drilled on the agreement lands prior to the end of the third year of the term (i.e. by 1 October 1992).

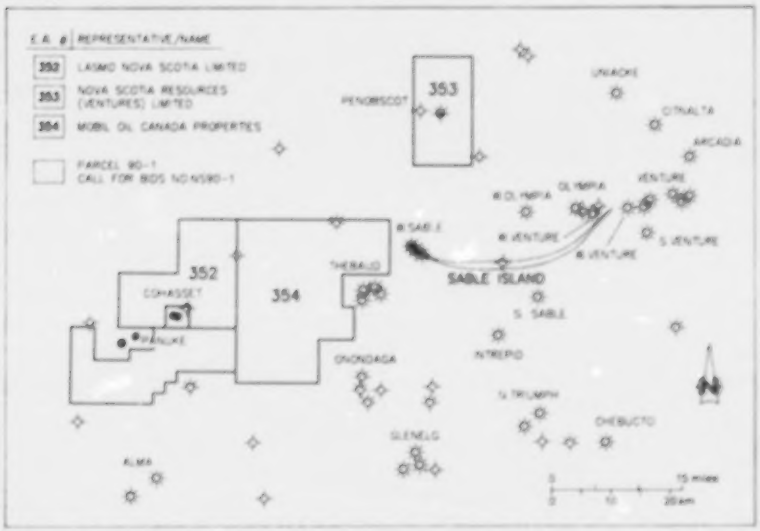


Figure 3. Offshore call for proposals and exploration agreements signed in 1989.

In November 1989, Shell's Uniacke and Glenelg E.A.s and Petro-Canada's Panuke E.A. reverted to the Crown, except for those areas designated by the Offshore Board to be 'significant discovery areas' which the companies will hold in perpetuity.

Nominations for lands closed again on 29 December 1989, with one parcel having been nominated by industry. The Offshore Board has asked for bids on this block (Fig. 3) to be submitted by 5 July 1990.

A summary of the current offshore holdings follows (Table 3).

Table 3. Offshore land summary at the end of the 1989-90 fiscal year.

Exploration Agreements
(excluding significant discovery areas)

Representative	EA Number	Acres	(Hectares)
Bow Valley Industries	235	95,775	38 760
LASMO	352	65,214	26 392
NSRL	353	45,713	18 500
Mobil	354	137,769	55 755
Sub Total		344,471	139 407

Development Plans

The highlight of the year was the filing of a development plan on 21 December 1989 for the Cohasset and Panuke project. LASMO and Nova Scotia Resources Limited are equal partners in a venture that, subject to regulatory approval, will see the small oil fields come into production in 1992.

Staff will be required to advise the Minister concerning approval of the development plan, and a detailed technical review has begun. Following public information sessions, which are to be held in April 1990, a commissioner will conduct a public review of the environmental and socio-economic aspects of the project on behalf of the Canada-Nova Scotia Offshore Petroleum Board.

ONSHORE OIL AND GAS ACTIVITY

A call for nominations was issued by the department in late 1988. Industry was invited to nominate lands for which they would be interested in obtaining oil and gas exploration rights. The department received nominations and conducted a competitive call for exploration proposals on three parcels of land. The call for nominations closed on 31 August 1989 (Fig. 4).

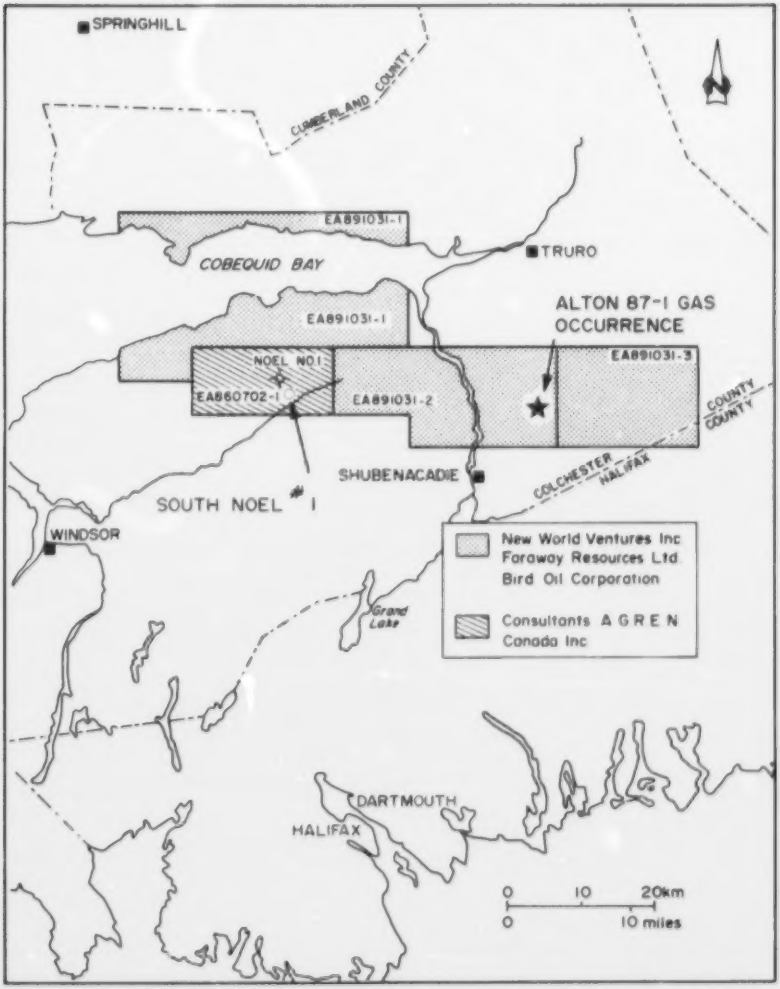


Figure 4. Onshore petroleum exploration agreements signed in 1989.

Proposals were judged on the basis of who offered the most attractive work program for each land parcel. A consortium comprising Bird Oil Corporation, New World Ventures Inc., and Far-Away Resources Ltd. submitted the most attractive work program for all three parcels. Their proposals call for total exploration expenditures of $1,810,000 on the three parcels over a three year period. Three exploration agreements have been signed with this consortium. These agreements commenced 31 October 1989 and will

last for three years. Their requirements include the drilling of an exploratory well on each parcel by the end of the third year.

An exploration agreement held by Consultants A.G.R.E.N. Canada Inc. expired on 2 July 1989. Consultants A.G.R.E.N. were granted a six month extension of this E.A. to 11 December 1989, after complying with certain conditions including the posting of a $20,000 performance bond. A well, South Noel #1, was spudded on the E.A. lands on 30 November 1989. Due to drilling problems encountered as the result of extremely cold weather, operations were suspended in December. The well is expected to be completed in April 1990.

Table 4 lists, by company, the current onshore oil and gas acreages held and Figure 4 shows these marked on a map.

Table 4. Summary of onshore oil and gas rights holders.

Agreement Holder(s)	Agreement Lands Area (acres)	(hectares)	E. A. No.	Rentals Paid
New World Ventures Inc.	98,367	39 809	891031-1	$ 4,777
Faraway Resources Ltd.	92,157	37 296	891031-2	4,476
Bird Oil Corporation	69,118	27 972	891031-3	3,357
Consultants A.G.R.E.N. Canada Inc.	46,780	18 648	860702-01	7,832
Total	306,422	123 725		$20,442

Summary of Onshore Coal Gas Rights Holders

Licensee	Negotiated Area (acres)	(hectares)	No. of EAs Negotiated	Rentals Paid
Cape Breton Development Corporation (CBDC)	184,163	74 560	1	$ 8,947.20

An onshore source rock study initiated by the Section under the Canada-Nova Scotia Mineral Development Agreement continued during the 1989-90 fiscal year. Data obtained have been processed. A number of new insights, interpretations and discoveries will be highlighted in the final report scheduled to be published during the next fiscal year.

A coal gas agreement has been concluded with Cape Breton Development Corporation. The corporation has agreed to begin

construction of facilities by May 1991 to utilize the coal gas currently being vented from the Lingan mine. A study is being initiated on the feasibility of using the methane/air mixture from the mine in the Lingan power generating station. Current production at the mine is 2.0 million cubic feet per day of methane equivalent of coal gas.

RELATED SECTION ACTIVITIES

Staff have worked with the federal government in establishing the land disposition policy for the offshore. The section is also involved in promoting the offshore resource to new explorers through publications and presentations. These two methods of promotion usually describe the results of technical studies of geological and geophysical aspects of the onshore and the offshore which were undertaken in-house or using consultants. The results are presented in various technical forums and publications.

A variety of maps and other display materials have been prepared for various oil and gas trade shows as well as for the department's open house. In particular, section staff produced, in conjunction with the Canada Oil and Gas Lands Administration, a high quality publication designed to promote exploration offshore Nova Scotia. It has been distributed to exploration managers worldwide.

Staff continue to be active on a number of intergovernmental committees developing technical regulations and guidelines which will apply to onshore and offshore petroleum activity.

MINING ENGINEERING DIVISION

P. W. Phelan, P.Eng., Director

INTRODUCTION

The Mining Engineering Division is responsible for the administration and regulation of the mining industry in the province on behalf of the Department of Mines and Energy. The division provides a diamond-drilling service to department geologists and is responsible for maintaining department vehicles and the equipment and facilities needed for drilling.

SIGNIFICANT EVENTS IN 1989-90

Operations at the Coxheath Gold Holdings Ltd. mine at Tangier were suspended in June 1989.

Westminer Canada Ltd. allowed the Forest Hill underground mine to flood and reclamation work was underway at year end. Westminer also began reclamation of the Beaver Dam underground exploration project.

Westminer Canada Ltd. dewatered the underground mine at Gays River, Halifax County, to investigate the feasibility of re-opening the mine. The company extracted a bulk sample of ore to test various mining methods and to do test milling of the ore. The mining and milling tests were successful. By year end, the company had decided to put the mine back into production and had applied for a mining lease.

The Nappan solution salt mine, previously owned and operated by the Domtar Chemicals Group, was sold on 30 March 1990 to Sifto Canada Inc., a subsidiary of Carey Salt Holdings Inc.

Following site clearance and some limited tunnel development, work on the underground coal mine being developed by Westray Coal Inc. near New Glasgow, Pictou County, was suspended pending financing for the project.

Mine leases have been renewed for the Evans Coal Mine at Chimney Corner, Inverness County, and for the Mosher Limestone Quarry in Upper Musquodoboit, Halifax County.

During the year, four companies extracted large bulk samples from five sites for gold, silica, lead and zinc. Details of the bulk sampling conducted in 1989 are shown in Table 5.

Table 5. Bulk sampling conducted during the 1989-90 fiscal year.

Company	Location	County	Mineral	Tonnage Mined
Antioch Resources, Ltd.	Caribou	Halifax	Gold	880 tons (800 t)
Nova Scotia Sand and Gravel	Shubenacadie	Colchester	Silica	4,630 tons (4200 t)
Seabright Exploration Incorporated	Moose River	Halifax	Gold	37,750 tons (34 250 t)
Westminer Canada Limited	Gays River Forest Hill	Halifax Guysborough	Lead/Zinc Gold	22,050 tons (20 000 t) 19,400 tons (17 600 t)

The Mining Engineering Division supervised reclamation work on the following sites, which were all previously affected by mining or exploration activity: Scotsville, Fourchu Cemetery, Fifteen Mile Stream and Stirling. Reduction in the operating budget available to the division seriously reduced the amount of diamond-drilling carried out during the year.

Mining Engineering Section

D. S. Jones, Ph.D., P.Eng., Manager

The Mining Engineering Section is responsible for ensuring that the province's mineral and coal resources are utilized to their optimum, and that mining operations are conducted in a responsible, efficient and acceptable manner.

This mandate includes reviewing proposals from industry for new mining projects or modifications to existing mines, and making recommendations for the issuing of mining leases, mill licenses and associated permits. The section also provides mining engineering and mineral processing advice and assistance to industry and government, and conducts economic analysis and feasibility studies on potential mineral deposits.

Drill and Mechanical Section

D. MacNeil, Manager

The Drill and Mechanical Section is responsible for operating the department's diamond-drills and maintaining all vehicles and mechanical equipment.

The amount of drilling completed by the department during the last several years is shown in Table 6. Details of drilling during the 1989-90 fiscal year are given in Table 7. Further details for individual holes are given in the departmental publication *Drilling Logs of Government Core Drills.*

Table 6. Annual drilling statistics (drillholes completed).

Fiscal Year	Number of Holes	Amount Drilled Feet	Metres
1985-86	14	20,538	6260
1986-87	61	19,203	5853
1987-88	38	17,623	5371
1988-89	38	20,164	6146
1989-90	7	5,316	1620

Table 7. Departmental drillholes completed during the 1989-90 fiscal year.

Site Name	Map Ref.	No. Holes	D.D.H. Designation	Drilled Feet	Metres
Eureka	11E/7D	1	UR 89-1	2,100	640
Stellarton	11E/10A	3	PG1-89, PG61-89 PG62-89	670	204
St. Margaret's Bay	11D/13C	3	B1P89-1 to 3	2,546	776
TOTAL		7		5,316	1620

MINERAL RESOURCES DIVISION

Peter S. Giles, Ph.D., Director

INTRODUCTION

A thorough knowledge of known mineral resources, and the geologically inferred potential for additional resources, is fundamental to the development and utilization of the province's mineral wealth. The acquisition of this information through branch activities and through the assimilation of externally-generated data is the prime function of the Mineral Resources Division. Dissemination of this information to a broad technical audience and to the public helps to promote realistic opportunities for mineral exploration and development.

Divisional activities are coordinated through three sections, each responsible for differing areas of specialized emphasis. In 1989, the Regional Surveys Section took new responsibility for investigations of glacial (surficial) geology, formerly part of the mandate of the Geochemistry/Quaternary Geology Section. The latter section remains responsible for exploration geochemistry. Minor re-assignment of professional staff accompanied this shift in reporting relationships. The role of the Mineral Deposits Section was maintained as in previous years.

The scope and scale of divisional activities declined in 1989 as the Canada-Nova Scotia Mineral Development Agreement entered its final year. Agreement funding was limited to support for the dissemination of information. No field programs were initiated and all staff were fully committed to the publication of geological maps and reports based on work completed as part of the 1984-89 agreement.

Negotiations for a renewed federal - provincial cooperative agreement on minerals were a principal focus of division management throughout 1989. The division hopes to continue many of the successful projects carried out during the 1984-89 Agreement.

Regional Surveys Section

J. D. Keppie, Ph.D., Manager

INTRODUCTION

The function of the Regional Surveys Section is to develop a

comprehensive understanding of the geology of Nova Scotia, to determine the broad geological potential for mineral resources, and to publicize the results of investigations to a largely technical audience. Section activities range through reconnaissance to detailed geological and geophysical mapping, and also include the study of selected rock units at surface and in the subsurface. The section also supports all activities of the Education and Public Awareness Program, which emphasizes the geology of the province, fundamental to a general appreciation for mineral resources, their ultimate use and public benefit.

PROJECTS

Work on three major projects neared completion in 1989. Each project was a contribution to the Canada-Nova Scotia Mineral Development Agreement.

Cumberland Basin Study

Over a four-year period beginning in 1985, a large area of sedimentary rocks in Cumberland, Colchester and Pictou Counties was mapped in detail in order to understand the total rock succession, its history of deposition and deformation, and its potential for mineral resources. Termed the Cumberland Basin, this area is known for its coal and rock salt production, and for numerous occurrences of copper, lead, zinc, vanadium, uranium, gold and silver. Potash is also known in association with rock salt.

Project maps have been released on Open File at a scale of 1:10 000 and compilation at a scale of 1:50 000 scale is nearly complete. The latter will be released in 1990 as four geological maps in colour. These maps will be the first geological maps of the complete basin to be made available to industry and the public.

A final comprehensive report on the project was completed in 1989. Release is scheduled for 1990. A subsidiary project which examined in detail the geology of the Pugwash rock salt mine has been completed. Three maps will be released in 1990, with a formal report.

Quaternary Map of Nova Scotia

For almost 15 years the division has been involved in the mapping of Nova Scotia's surficial or glacial deposits, which cover virtually the entire province as a product of the last major ice ages. This material may itself form valuable resources, for example as sand and gravel

deposits for industrial use. The presence of a veneer of glacial deposits over bedrock becomes a factor in exploration for hidden mineral deposits as well, so that a thorough knowledge of the nature, distribution and chemistry of these deposits is of importance to mineral exploration.

During 1989, the division undertook to compile the results of these long-term investigations in the form of a 1:500 000 scale map of Nova Scotia portraying glacial deposits. This map, which is the first provincial summary of its kind in Canada, will be one of a Nova Scotia series of thematic maps already available at 1:500 000. Release is scheduled for the 1990-91 fiscal year.

Metallotectonic Map of Nova Scotia

The role of plate tectonics, commonly known as continental drift, as a process linked to the generation of mineral deposits is becoming more and more apparent within the geological community. The division has, for several years, attempted to synthesize all relevant information in Nova Scotia and to portray the province in map form relating the tectonic history of different areas to known or suspected mineral deposits. The data-acquisition phase of this major project neared completion in 1989, although transformation into map format has not yet begun. This map will be the first comprehensive attempt to portray metallotectonic information in this way in North America, and one of the first in the world.

EDUCATION AND PUBLIC AWARENESS PROGRAM

The main purpose of this program is to provide, in both the short and long term, a balanced public view of all aspects of mining and mineral exploration. The objective is to create a better understanding of the province's mineral industry and the contribution it makes to the economy of Nova Scotia. In addition, the Public Education and Awareness Program attempts to publicize the activities of the division and the branch, promoting opportunities to industry and, at the same time, contributing to a broader awareness of all activities within the mineral sector.

A major accomplishment of the program in 1989 was the completion of the Geological Highway Map of Nova Scotia, Revised Edition. This was a cooperative project between the Atlantic Geoscience Society, the Nova Scotia Museum and the Department of Mines and Energy. The map is designed to be understood by non-geologists, but has sufficient information to be useful to geologists as

well. The map portrays the geology of Nova Scotia in simplified form, the location of present and past-producing mines and quarries, and sites of interest to rock, mineral and fossil collectors.

A publication dealing with careers in geology was completed in 1989 as a cooperative project with the Geology Committee of the Atlantic Provinces Council on the Sciences. The brochure will be used as an information source for students in high school and university.

Displays presenting a range of both technical and non-technical information were presented in a variety of venues, and were viewed by up to 45,000 people in shopping malls and at various exhibitions held annually throughout the province. Other activities, including short seminars, lectures and geological walking tours, also assisted in providing smaller audiences with information on the geology and mineral industry of Nova Scotia. Several oral presentations to Elderhostels were particularly well received and resulted in favourable press review and in personal endorsement for the Education and Public Awareness Program.

The program addresses a need identified in mining departments of government and in industry across Canada. Nova Scotia was the first province to formally introduce such a program, using the Canada-Nova Scotia Mineral Development Agreement as a funding vehicle. Nova Scotia's program, when presented to a national meeting of government representatives dealing with Mineral Development Agreements, was considered a model to emulate in other Canadian jurisdictions.

Mineral Deposits Section

A. K. Chatterjee, Ph.D., Manager

INTRODUCTION

The Mineral Deposits Section has the responsibility to provide information specific to the province's mineral deposits and mineral resource potential. It accomplishes this mandate by detailed studies of mineral deposits and mines, and by mapping of areas with suspected strong mineral potential. Information that helps to explain the origin and location of deposits may provide valuable assistance in the search for similar or related deposits.

PROJECTS

Mineral Deposit Investigations

In 1989, significant advances were made in the understanding of vein-hosted gold mineralization in the Meguma Zone of southern Nova Scotia. Studies of the Beaver Dam, Cochrane Hill and Caribou deposits were completed, with reports scheduled for release in 1990. The report on the Caribou deposit, a well known former gold producer, was a joint effort involving section staff and geologists employed at the deposit, and represents the first such collaborative effort in preparing information for public access. This close co-operation through all stages of a section project is an expression of a strong mutual desire to see successful exploration projects leading to mine production.

Work continued on several other gold deposits in southern Nova Scotia in production during 1989, most notably the Tangier deposit, the first modern Meguma gold deposit to be granted a mining lease. Section staff provided geological assistance in the critical stages of defining ore-shoot geometry.

Geological investigations of the Rio Kemptville tin deposit in southwestern Nova Scotia continued in 1989. Several reports were submitted to scientific journals for publication, and project results were included in a presentation to the annual meeting of the Prospectors and Developers Association of Canada in the form of a scientific display. The Rio Kemptville mine provides critical support for a perceived strong potential for granite-related mineralization in southern Nova Scotia.

South Mountain Batholith Project

Preparation of geological maps of the South Mountain Batholith was completed in 1989, again responding to the need for exploration-specific information on the granites of southern Nova Scotia. Maps released cover almost the entire project area at a scale of 1:50 000, and final releases are anticipated in 1990. A similar compilation of bedrock geology at a scale of 1:500 000 is in preparation.

The South Mountain Batholith project is the most ambitious undertaking attempted by the Mineral Resources Division. The batholith covers almost one-third of southern Nova Scotia, and extends virtually from Halifax to Yarmouth. Maps and reports produced have been well received by the mineral industry as a

fundamental guide to mineral exploration. The ultimate benefit of this project will be in more efficient and effective exploration in this large area for many years to come.

Geochemistry Section

P. J. Rogers, Ph.D., Manager

INTRODUCTION

Applied exploration geochemistry, using the elements present in a variety of media, including waters in streams and water wells, recent sediments in streams and lakes, glacial materials and even living vegetation, is the focus of activity for the Geochemistry Section. The scope of projects undertaken ranges from province-wide geochemical surveys, to site-specific, very detailed investigation of anomalous metal concentrations that might indicate a hidden mineral deposit.

Large geochemical databases are generated by activities within the section. These are widely available to assist in mineral exploration and to stimulate activity in the private sector. Other uses, such as in the addressing of naturally-occurring environmental impacts, are of increasing importance to the province.

The Geochemistry Section has a lead role within the division and within the branch for computer applications and automated handling of data, including an increasing emphasis on Geographic Information Systems (GIS) as a tool for these purposes. Sectional expertise in this area was recognized in 1989 by the election of Dr. P. J. Rogers, section manager, as the founding president of the newly-created Geomatics Association of Nova Scotia. During 1989, the section acquired SPANS software to assist in the management and manipulation of geochemical databases. This represents a major step toward the goal of establishing a capability to simultaneously consider multiple digital databases, making expanded use of computer capabilities.

PROJECTS

During 1989, the section released an interpretative analysis of Meguma Zone lake sediment data, previously released in raw data form. This synthesis attempts to evaluate, in a multi-element context, the exploration potential of individual lake catchment basins.

New data released in 1989 included the results of heavy mineral stream sediment surveys undertaken in northern Nova Scotia and Cape Breton Island. Of particular note was the publication of a biogeochemical survey of a relatively large area of the eastern Meguma Zone of southern Nova Scotia. The survey, the first regional survey in Canada to use vegetation as a sampling medium, was a joint effort by geochemists of Energy, Mines and Resources Canada and this department. It sparked particular interest in the exploration community as an efficient and cost-effective means to assess potential in large areas.

Similar techniques were applied at a much more detailed scale in comparing the use of biogeochemistry to soil and glacial till geochemistry in the vicinity of the Beaver Dam gold deposit in eastern Nova Scotia. Comparison of the response of lake sediments to regional biogeochemistry was highlighted in a paper presented to the International Geological Congress in Washington, D. C. These new developments in the field of biogeochemistry provided an international focus on Nova Scotia, reflecting credit on joint Canada-Nova Scotia involvement through the Mineral Development Agreement.

The preparation of a Geochemical Atlas for Nova Scotia neared completion in 1989, with all regional databases fully edited and ready for inclusion in the Atlas. This portfolio of maps will be released in 1990.

In addition to project activities, section staff continued to respond to direct requests from industry for assistance in the interpretation of private sector survey data. In 1989, for example, staff undertook an independent assessment of soil data generated in part of the Cape Breton Highlands for gold exploration.

MINERAL DEVELOPMENT DIVISION

D. A. Murray, M.Sc., Director

The Mineral Development Division is divided into two sections, the Resource Geology Section and the Mineral and Petroleum Titles Section. The responsibilities of the division lie in the orderly development and promotion of the province's mineral resources. Included in these responsibilities are mineral resource regulations, mineral titles policies, and assistance in the promotion and development of all minerals. It also maintains geological information through the departmental libraries and drill core library. The division monitors mineral production and mineral exploration activity in the province and provides liaison among mineral producers, the exploration research establishments, landowners and government agencies. The division also collects and compiles mineral production and exploration statistics.

One of the major achievements for the year was the introduction of Bill 14 - Mineral Resources Act during the spring 1990 session of the Legislature.

Mineral and Petroleum Titles Registry

R. Ratcliffe, Registrar of Mineral and Petroleum Titles

The Mineral and Petroleum Titles Registry is responsible for receiving applications for mineral and petroleum rights and for issuing and registering licenses or leases. In addition, any documents affecting licenses, such as transfers of title, assignments of interest, option agreements, special licenses and exploration agreements, are registered by this office. The registry also receives all statements of exploration expenditures and assessment reports that pertain to the renewal of licenses and leases. Maps showing the disposition of lands under license or lease are maintained and continually updated. These maps are available for a nominal charge. Applications for underground gas storage rights and treasure trove licenses are also processed through this office. Information concerning production and employment in Nova Scotia's mines and quarries is received and tabulated by the registry and published annually.

A large number of inquiries from industry, the public and other government departments are answered each year. Most deal with procedures for obtaining licenses, information on past exploration and mining activities, statistical information on production for operating properties and general questions about licenses. The registry

is responsible for all fees, bonds and other monies due for licenses, leases, statutory work deposits, payments in lieu of work and the sale of claims reference maps and copies of legislation from the Halifax office library.

The registry maintained a moderate level of activity in 1989, which is reflected in Table 8.

Mr. Ian MacLellan became a permanent staff member in July 1989.

Resource Geology Section

J. M. Bingley, B.Sc., Manager

INTRODUCTION

The Resource Geology Section works with industry, educational institutions, other government agencies and the public to promote a strong mineral industry and to provide geological and geostatistical information and services. The personnel needed to perform these functions are geologists, planners, mineral technicians, librarians and secretaries, 13 of whom are situated in the Halifax office and nine in Stellarton. An additional six or more student assistants and casual employees are hired for the summer months and to provide peak-time assistance.

The Canada - Nova Scotia Mineral Development Agreement that terminated 31 March 1989 was extended by the province to permit an additional year for compilation and publication of project results. A new, two year Mineral Development Agreement planned to extend until 31 March 1992 will continue the employment of 10 Resource Geology Section staff in new and continuing projects.

HALIFAX OFFICE ACTIVITIES

Functions and services provided in the Halifax office are:

- maintenance of the publicly accessible departmental library, which consists of extensive geological, mining and energy related materials,
- industrial minerals research (Aggregate Resource and Gypsum/Anhydrite projects) and assistance to industry,

Table 8. Mineral exploration trends in Nova Scotia.

		1982	1983	1984	1985	1986	1987	1988	1989
SUMMARY (onshore)									
Value of Reported Assessment Work ($)		4,100,000	4,200,000	2,625,646	2,389,351	9,954,014	26,713,524	29,612,896	31,333,645
Exploration Expenditure ($)		5,553,000	7,000,000	7,300,000[1]	8,000,000	20,000,000[1]	45,000,000[1]	49,000,000	29,000,000
Total Licences Issued		1,298	1,350	1,039	1,025	1,306	1,965	1,342	1,031
CLAIMS RECORDED ONSHORE[2]									
General Licences	claims	39,626	40,630	26,627	27,809	36,714	53,516	31,860	27,368
	acres	1,585,040	1,585,040	1,065,080	1,112,360	1,468,560	2,140,640	1,274,400	1,094,720
	hectares	648 871	657 789	431 032	450 166	594 318	866 305	515 742	443 027
Salt, Potash	claims	1,065	505	1,257	830	192	--	232	232
	acres	42,600	20,200	50,280	33,200	7,680	--	9,280	9,280
	hectares	17 240	8 175	20 348	13 436	3 108	--	3 756	3 756
Coal	claims	3,072	4,565	3,584	3,584	482	1,682	2,829	1,955
	acres	122,880	182,599	143,360	143,360	19,280	67,280	113,160	78,200
	hectares	49 729	73 897	58 017	58 017	7 803	27,228	45 795	31 647
Number of Mineral Assessment Reports		126	188	127	108	154	238	414	276
Total Areas Held	acres	1,627,640	1,827,999	1,258,720	1,280,920	1,495,520	2,207,920	1,396,840	1,182,200
Under Licence	hectares	709 219	739 781	509 397	521 619	605,229	893,533	565,293	478,430
PETROLEUM LICENCES ISSUED									
Land Areas	licences	68	93	106[3]	--	3	4	5	2
	acres	5,419,952	8,048,306	8,567,791[3]	--	3,996,026	3,582,255	3,766,493	230,310
	hectares	2 193 424	3 257 104	3 467 338[3]	--	1 617 170	1 449 719	1 524 279	93 205
Submarine Areas	licences	168	--	--	--	--	--	--	
	acres	33,965,867	--	--	--	--	--	--	
	hectares	13 745 798	--	--	--	--	--	--	

[1] estimate from Nova Scotia Department of Mines and Energy sources
[2] claims are 40 acres or 16.2 ha each
[3] as of 1 July 1984

- compilation and publication of various mineral-related databases (GEOSCAN, drillholes, mineral occurrences, etc.),
- compilation of databases and maps for the Land Use Policy Development Project, and
- preparation for publication or open file release of completed project reports, maps, and various types of information circulars, pamphlets, catalogues, etc.

INDUSTRIAL MINERALS

Mineral Resource Projects

Four industrial mineral programs designed to identify and promote industrial mineral resources were operated in 1989-90. The following outlines describe the activities of each project.

Aggregate Resource Project

The primary functions of the aggregate program during 1989 were resource evaluation and providing technical assistance to the aggregate industry. The majority of time was used to compile and interpret data on the aggregate potential of Cumberland and Colchester Counties. Although most of this information was collected in previous years, a limited amount of field work was conducted during the current year to assess the most recent findings. The result is that several new aggregate deposits have been identified, including large granular aggregate deposits and strategically located bedrock deposits of high quality. Granular aggregate maps at a scale of 1:50 000 are in the final stages of drafting and the accompanying report will be published in 1990.

Building Stone Project

At Hammonds Plains, Halifax County, a quartzite deposit was mapped, sampled and tested for use as an aggregate resource. The results of this work were reported in Department of Mines and Energy Open File Report 89-002.

In 1989 a diamond-drilling program was completed on black granites at Erinville, Guysborough County, and South River Lake, Antigonish County. A second drilling program was completed on grey granites at Nictaux West, Annapolis County.

Gypsum/Anhydrite Project

The Gypsum/Anhydrite Project was initiated in June 1985 as part of the Canada - Nova Scotia Mineral Development Agreement. The primary goal of the project has been to develop an inventory of the gypsum and anhydrite resources of Nova Scotia. The secondary goal of the project was to foster cooperation between the department and industry, and also to promote alternate uses for the province's gypsum and anhydrite resources.

By year end 1989 the final report was completed and in the editing stage. Occurrence descriptions have been arranged by counties and provide a synopsis of the most recent information available on each particular area with respect to geologic setting, field observations, subsurface intersections (where available), thickness of overburden, depth of hydration and quality of material (where available). Additionally, property ownership and/or gypsum lease holdings information was included where relevant. This information is formatted to assist those interested in exploration and development to select areas having the greatest potential, as well as those individuals merely interested in knowing where occurrences may be found.

Information has been gathered on a number of prospective areas that were selected for drilling programs. The extent of these programs will be dependent upon the initial results from each area.

Assistance continues to be given to parties interested in gypsum and anhydrite in the province. New developments include the gypsum paper-fibre composite wallboard plant being constructed by Louisiana-Pacific Canada Ltd. at Point Tupper, Richmond County. In addition, locally mined and processed anhydrite is currently used in large scale trials as a gateside pack and back fill material in Cape Breton Development Corporation's Lingan Colliery in Lingan, Cape Breton County. This anhydrite will replace other materials presently being imported for these purposes. Current research carried out on anhydrite by the Technical University of Nova Scotia has shown it can be used in screed flooring using proven technologies.

Various Commodities Project

A Various Industrial Minerals Commodities Project was initiated in May 1986 to update and improve the database on occurrences or deposits of various industrial minerals. Included are andalusite, barite, beryl, brucite, dolomite, garnet, graphite, limestone, manganese,

silica, spodumene, topaz, wollastonite and other minerals that may have development potential.

A final report dealing with individual industrial mineral commodities that have development potential is scheduled for release in 1990. Four separate Open File Reports dealing with specific exploration projects conducted during the Various Commodities Project, have been, or will be released shortly. Included here are reports of geological and drilling programs at Chegoggin Point, Yarmouth County (silica, garnet) and Glencoe, Inverness County (limestone, marble and dolomite).

Technical liaison continued with companies operating in the province and with others investigating potential industrial mineral development opportunities.

Industry Activities Highlights

Activity in the industrial minerals industry continued at a very high level in 1989-90. The following paragraphs identify several new developments in various sectors of the industry.

Aggregates. Kellys Mountain, Victoria County. In 1988 Kelly Rock Limited announced its interest in developing a large granite aggregate quarry on Kellys Mountain, Victoria County. Work on the site included diamond-drilling, bulk sampling and aggregate quality testing. In November 1989 Kelly Rock Limited registered its proposed aggregate quarry as a Class I undertaking under the Environmental Assessment Act and Regulations, and submitted an Environmental Impact Assessment Report to the Department of the Environment.

Dolomite. Kellys Cove, Victoria County. Mosher Limestone Company Limited, operators of the dolomite deposit and grinding mill at Kellys Cove, began construction of a ship loading pier at Kellys Cove in 1989. Mosher Limestone expects to be loading vessels in early 1990.

Gypsum and Anhydrite. In 1989, over 6.5 million tonnes of gypsum and 120 000 tonnes of anhydrite were produced from Nova Scotia's quarries.

Limestone. Lafarge Canada Inc. continued an evaluation program on a high calcium limestone deposit in the central mainland region of the province. Several potential properties have been isolated

by the initial work program and are being further evaluated through drilling and bulk sampling.

Lafarge hopes to develop additional limestone deposits near its Brookfield, Colchester County, facility to meet the expanding markets for speciality cements and to extend the life of the present quarry. Production and shipments continued for the third uninterrupted year at Brookfield.

Kelrock Minerals Ltd., which recently became the industrial minerals division of AquaGold Resources Ltd., has mineral rights on eight deposits of limestone, dolomite and marble on Cape Breton Island. AquaGold has drilled and bulk sampled their limestone deposits at Glen Morrison, Cape Breton County, and Glendale, Inverness County, for coal-fired fluidized bed combustion tests conducted by Nova Scotia Power Corporation.

Salt. In 1990 Carey Salt Holdings Inc. of Mission, Kansas, purchased Sifto Salt from Domtar Inc. The Sifto Salt operations, which include the Nappan, Cumberland County, plant, were put up for sale in 1989. Carey Salt is a major salt producer in the United States.

On 29 June 1989, the Captain Edward V. Smith, a large lake boat converted to a self-unloading barge, began hauling salt from Pugwash, Cumberland County, for The Canadian Salt Company. The vessel, owned by Keybulk Transportation of Montreal, is capable of doubling the size of salt shipments moving out of Pugwash harbour. In 1987-88 improvements were made to the Pugwash wharf and the harbour channel was dredged.

Stone. In 1989 Heritage Memorials of Windsor was granted access to a granite building stone deposit on Crown land at Terence Bay, Halifax County. Heritage expects to be working the deposit in 1990. Heritage has recently installed new stone polishing equipment in the Windsor plant. This equipment operates automatically and will allow flexibility in stone finishing for the production of many new products.

MINERAL LAND USE POLICY DEVELOPMENT

The Department of Mines and Energy initiated a Land Use Policy Development Project to encourage the protection and prudent use of lands underlain by mineral and energy resources and to provide input to future land use planning. A growing concern for the department as

a resource manager is an increasing occurrence of conflicting land use issues surrounding mineral exploration and development, including a gradual reduction of land access due to other resource management and municipal planning policies. The amount of land accessible to exploration has a direct bearing on the overall potential for the discovery of mineral and energy wealth. Through the Land Use Project the department is taking steps to avoid any unnecessary preclusion of use of lands that have known mineral and energy resource potential. Issues of land access and land use converge when municipal plans are adopted that inadvertently guide community development over or near potential deposits of mineral and energy resources. There is a concern that municipal land use policies and by-laws are not adequately accounting for mineral resource potential lying hidden below the surface.

The department is attempting to generate better understanding of mineral and energy resources by industry, the public and other provincial departments. The Land Use Policy Development Project has been developed to channel mineral resource information to the provincial and municipal planning community.

A three-phased approach has been defined to carry out the project:

Phase one: Information gathering and creation of a mineral land use information base. Products include a series of 18 mineral resource land use maps and handbooks.

Phase two: Mineral potential mapping of Nova Scotia.

Phase three: Land use policy recommendations concerning mineral, aggregate and energy resource lands. Groundwork will be laid for the adoption of a provincial land use policy in accordance with section 7 of the Planning Act.

Mineral Resource Land Use Maps and Handbooks

Mineral Resource Land Use (MRLU) map sets have been compiled and released as Open File Maps (OFMs) for Halifax County (OFMs 88-001 to 88-012), Hants County (OFMs 88-017 to 88-022), Cape Breton County (OFMs 88-033 to 88-038), Kings County (OFMs 88-044 to 88-049), and Lunenburg County (OFMs 89-005 to 89-009). Maps in preparation include the Pictou County set. MRLU Handbooks in preparation include the Province of Nova Scotia, Halifax County and Hants County handbooks. A Preliminary Design

Brief was prepared to guide the future MRLU publications program.

A paper entitled *Mineral Resource Management and Land Use Planning: A Background Study* is in preparation. This paper discusses the results of an NSDME survey on mineral-based issues within the context of municipal land use planning.

Mineral Land Use Database

Development of the mineral land use database is a continuing project. Land use and resource management bibliographic information is being entered into a networked database (REVELATION).

Resource Planning

The land use staff receives requests for mineral resource information from planners, planning consultants and resource managers. Several information packages with reports and maps have been prepared for input to specific land management plans and projects. Examples include utility corridor planning, site locations for ash disposal, a power plant site location, and a pit and quarry rehabilitation study.

Pit and Quarry Rehabilitation Study

Gardner Pinfold and Associates were awarded a contract for an Energy, Mines and Resources Canada study on cost-effective methodologies for pit and quarry reclamation in Nova Scotia. The Land Use group provided the study idea and was the main liaison with the consultant. Emphasis was given to ideas encouraging integration of the environment and economy regarding the after-use of mined land. A final report has been received and should be made available to the public early in the 1990 fiscal year.

Other Activities

Along with providing input to papers and policy produced by the Interdepartmental Committee on Land Use, the group also records and monitors changing land use, such as the designations of ecological reserves and surface water supply watersheds.

The Land Use group also forms part of an interdepartmental review network for aquaculture licenses and experimental permits. The review process allows the department to screen proposed aquaculture sites for potential conflict with the exploration and mining

sector. This is in keeping with the necessity to monitor all land and near-shore resource activity in order to maintain a relatively conflict-free land management practice.

LIBRARY SERVICES

The department maintains two technical libraries. The main library is located in the Halifax office with a branch library in Stellarton. Holdings include more than 10,000 maps, 5000 exploration assessment reports, 913 open file reports, 1028 open file maps, 723 theses, 1200 journal literature references, 240 journals and trade magazines, more than 3000 reference texts and hundreds of government documents. The libraries function as resource centres for information on geology, energy resources and mining history. The libraries provide the following services and facilities:

- reference and information service to the general public, provincial government personnel, professional geoscientists, engineers and consultants in private industry;
- interlibrary loans service to staff and other libraries;
- database searches for staff;
- sale of departmental and Geological Survey of Canada publications and maps;
- catalogued and classified records of the library holdings, including books, serials, exploration assessment reports, open file reports, open file maps and theses;
- a mailing list of individuals, institutions and corporations that wish to be informed of our activities and publication releases;
- facilities for photocopying, microfiche reading and printing, and for making white-print duplicates of maps; and
- sale of federally and provincially published topographic maps (Stellarton only).

The main library continued to be busy with the demand for

information services and products during the 1989-90 fiscal year. A total of 400 new books were catalogued this year and more than 800 company and government annual reports were classified and entered into the library database. Work has continued on the library database which now contains approximately 3000 records. This represents one-third of the collection, excluding government documents. More than 1000 people (excluding staff) made use of the facilities and approximately 1000 telephone inquiries and 1000 mail inquiries were answered.

Revenue from the sale of more than 2100 maps, 5100 pages of photocopying, 4000 pages of microfiche prints, 677 white prints and 4701 departmental publications generated approximately $25,000. More than 13,000 publication release notices were mailed out, as well as 650 announcements for our annual open house and over 800 annual reports. A total of 325 interlibrary loans were processed and over 274 orders for books and supplies were placed.

MINERAL INVENTORY

The Mineral Inventory group is responsible for the collection, verification, organization and dissemination of mineral resources information. The group's main functions are: to verify that submitted exploration assessment reports comply with the Rules and Regulations of the Mineral Resources Act for the purpose of renewing exploration licenses; to establish and maintain databases of mineral resource information; and to publish pertinent compilations of mineral resource information for use by the department, other government agencies, the mineral exploration industry and the general public.

Three major activities involving three people were in operation during the 1989-90 fiscal year. These activities were Assessment Reports verification, and operation of the GEOSCAN bibliographic database and the Metallic Mineral Occurrences database.

Assessment Reports Verification

A total of 204 confidential assessment reports, submitted for the purpose of renewal of exploration licenses, were checked. Some 145 of these reports were approved without requiring any modifications, and the appropriate exploration licenses were recommended for renewal. The remaining 59 assessment reports required additional information before they were approved and the exploration licenses recommended for renewal.

Bibliographic Database

GEOSCAN is a bibliographic database that provides access to publicly available geoscience literature concerning the Canadian landmass and offshore regions. The database presently contains over 134,000 records and is cooperatively produced from the indexing contributions of 11 federal, provincial and professional geoscience organizations located throughout Canada. The Geological Survey of Canada, through the National GEOSCAN Centre, coordinates these indexing activities and provides computer resources in support of this activity (see NSDME Report 89-3).

Report 89-2 *Index to Assessment Reports, Open File Maps, Open File Reports and Publications for 1988* was released in October 1989.

Metallic Mineral Occurrences Database

In order to improve the quality and reliability of the information in the Metallic Mineral Occurrences data cards and database, the program of systematic reference researching and checking, coupled with selected field checking, continued during the 1989-90 fiscal year. A total of 182 metallic mineral occurrence data cards were researched, and limited field checking was conducted in parts of Cape Breton Island. Some 134 data cards were revised and updated, 48 cards were eliminated from the dataset and 22 new metallic mineral occurrences were documented. Since this program began in the 1987-88 fiscal year, a total of 693 metallic mineral occurrence cards have been checked, 563 newly revised cards have been generated, 130 cards have been eliminated from the dataset and 42 new metallic mineral occurrences have been documented. Reference researching and checking have now been completed for metallic mineral occurrences on N.T.S. sheets 11E; 11F/9, 10, 11, 13, 14, 15 and 16; 11G/13; 11J/4; 11K/1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 15 and 16; 11N/1 and 2; and 21H.

A metallic mineral occurrences database, based on information in the revised metallic mineral occurrences data cards, has been created using Advanced Revelation as the database management software. As of 31 March 1990, 270 metallic mineral occurrence records had been entered into this database.

STELLARTON OFFICE

Part of the Resource Geology Section shares a regional office with

three other divisions in the department's building at 32 Bridge Avenue, Stellarton, Pictou County. Responsibilities and activities performed by staff of the Regional Exploration Services group include: liaison with, and monitoring of, the mineral exploration industry; annual surveys of all mining and exploration companies active in the province to generate statistical compilations of exploration and development activity; supervision and operation of the drill core library; in-house technical support services and expediting; field equipment storage and maintenance; storage of geotechnical samples; library services, including storage of assessment reports and other geotechnical data; storage, distribution and sales of departmental publications and maps, and sales of maps from the Land Registration and Information Service and Energy, Mines and Resources Canada. Permanent staff of this group consists of two geologists, one mineral technologist, one mineral technician and a clerk/librarian. Term staff consists of two core library geologists, a core library technician and an industrial minerals geologist.

Exploration Monitoring

The program of exploration monitoring provides direct liaison with industry through continuous contact with industry personnel, by regular visits to company offices and exploration sites, and by telephone contact. In addition, the monitoring staff review assessment and other reports submitted by industry and carry out an annual survey of all producers and exploration companies. The survey provides data on expenditures made for exploration, development, capital improvements and repairs in all sectors of the mining industry. As a result of these activities, the department is able to maintain an awareness of current exploration and development activities and is able to identify and respond to problems as they arise and review or modify policies and regulations where necessary.

Drill Core Library

The department's drill core library exists to preserve drill core from exploration and geological investigations carried out by the department and the mining industry. Drill core in the library is available for use by industry geologists, departmental staff, Geological Survey of Canada geologists, university researchers and others who work toward understanding the province's mineral resources.

Headquarters for the core library is the Stellarton Industrial Park. Other core storage facilities are located in the Air Industrial Park at Debert, Colchester County, at Malagawatch, Inverness County,

and the Stellarton Office.

Drill core received during the year totalled 10 244 m from 134 holes drilled between 1962 and 1989 (Table 9). Approximately 67.5% of the core was produced by industry exploration programs, with 6584 m of this core coming from the Yava lead property at Salmon River, Cape Breton County.

Expediting and Storage

The Stellarton office serves as the main storage area for rocks, oil well chips, and other samples derived from field activities. Departmental publications, internal reports, assessment reports and field equipment are also stored at that facility. Transportation of drill core, equipment, samples and publications to or from field locations or the Halifax office is provided by Stellarton staff, and assistance is provided at public exhibitions and shows.

Mineral Exploration Activity in 1989

Introduction. Exploration expenditures for 1989 are estimated at $29 million or about 59% of the record $49 million spent in 1988. Exploration for gold continued to account for most of the exploration work with the remainder devoted to industrial mineral, base metal and coal prospects (Fig. 5).

Gold. Exploration for gold continued to highlight exploration activities for metallic minerals during 1989 with interest continuing to be focused on the historic gold mining districts of Halifax and Guysborough Counties in the southern mainland area of the province. Work was concentrated on a detailed evaluation of several known gold occurrences hosted by the Ordovician or older metasediments of the Meguma Group. Gold exploration was also carried out on Precambrian rocks in the highland areas of northern Cape Breton Island.

Coxheath Gold Holdings Limited continued underground exploration and development work on the Tangier gold property in Halifax County during the first half of the year. Additional drifting and raising, analytical work and underground diamond-drilling were completed as part of an ongoing program to evaluate ore reserves. The company received a mining lease in December 1988 and went into production at the beginning of 1989 for a short time before putting the operation on hold.

Table 9. Drill core acquisitions to the core library, Stellarton, for the 1989-90 fiscal year.

NTS	COMPANY OR ORGANIZATION	YEAR DRILLED	COMMODITY OR PROJECT	LOCATION	COUNTY	NO. OF HOLES	HOLE NAMES	CORE SIZE	TOTAL FEET	TOTAL METRES
11D/13	NSDME, Mineral Resources Division	1989	Granite lithology	Big Indian Lake	Hants	3	BIP-89-1 to BIP-89-3	HQ,NQ BQ	2529	770.8
11E/7	NSDME, Mineral Resources Division	1989	Stratigraphy	Eureka/Island East River	Pictou	1	EUR-89-1	HQ,NQ BQ	2078	633.4
11E/9	Ridge Brokers Limited	1989	Limestone	Otter	Antigonish	4	OH-89-1 to OH-89-4	BQ	436	132.9
11E/10	NSDME, Mining Engineering Division	1989	Coal Stratigraphy	Stellarton (MacLeod Seam)	Pictou	3	P-n0-89 to P-n2-89	NQ	568	173.1
11F/12	Ridge Brokers Limited	1989	Limestone	Southside Antigonish Harbour	Antigonish	n	SSH-89-1 to SSH-89-6	BQ	619	188.7
11F/16	Barymin Resources/Yava Mines Ltd.	1977-81	Lead	Silver Mine	Cape Breton	62	Various from 248-3n3	BQ,NQ	14,092	4295.2
11F/16	Phelps Dodge	1982-89	Lead	Silver Mine	Cape Breton	20	Various from 28-247	BQ,NQ	6480	1950.7
11F/16	Tahsman Mines Limited/Gunners Ltd.	1982	Lead	Silver Mine	Cape Breton	2	7, 27	BQ,NQ	1110	338.3
11J/4 and 5	NSDME, Energy Resources Division	1977-78	Coal	Offshore Glace Bay	Cape Breton	13	H-1A, H-2, H-3, H-6 to H-8	Various	4778	1456.3
11K/4	NSDME, Energy Resources Division	1978	Coal	Offshore Malvern	Inverness	1	M-2A	4 inch	183	55.8
11K/8	NSDME, Energy Resources Division	1977-78	Coal	Offshore Point Aconi	Cape Breton	5	H-12, H-12A, H-8, P-5 and P-6	Various	568	173.1
21A/14	NSDME, Mineral Development Division	1989	Building Stone	South Williamston	Annapolis	3	SWN-89-1 to SWN-89-3	NQ	184	56.1
	TOTAL					136			33,545	10 224.5

Core Acquired from Departmental Drilling Programs: 10,888 ft./3 318.7m from 29 holes (5 projects)
Core Acquired from Company Drilling Programs: 22,657 ft./6 905.9m from 105 holes (3 projects)

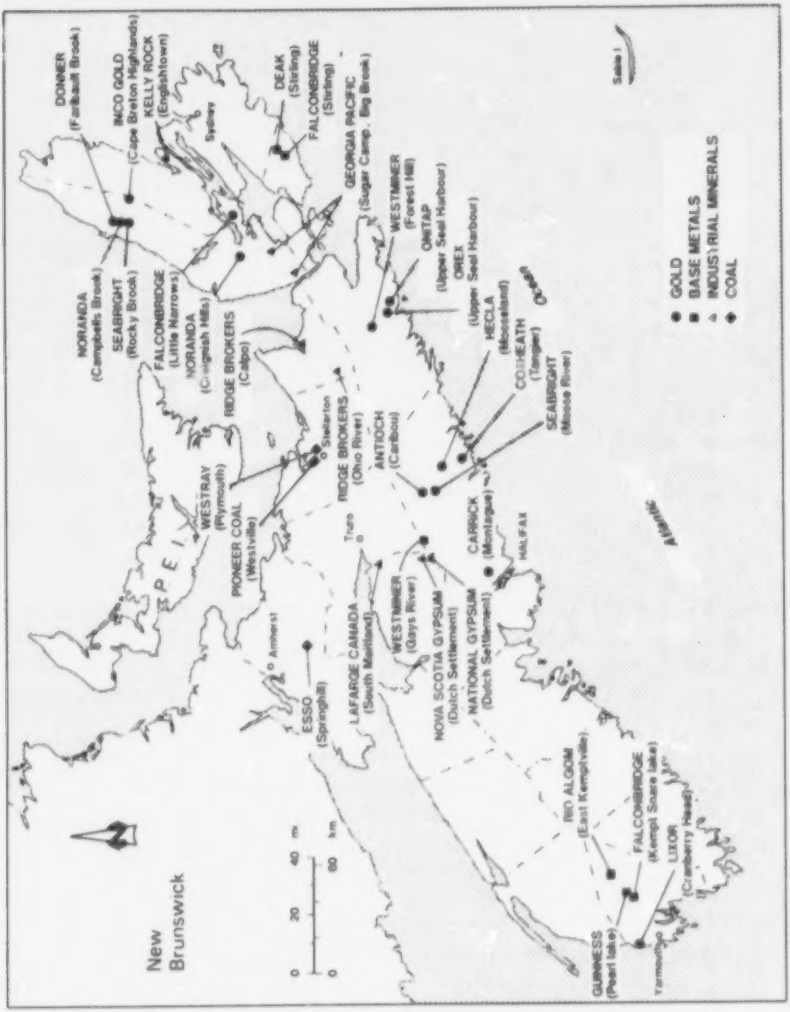


Figure 5. Exploration and development projects in Nova Scotia, 1989.

Antioch Resources (N. S.) Limited began a detailed underground exploration program on the Caribou gold property at the beginning of the year. Underground diamond-drilling and bulk sampling were completed to assist in the evaluation of ore reserves and exploration potential of the property.

Exploration Orex Incorporated, in an option agreement with Onitap Resources Incorporated, continued a detailed exploration program on the Upper Seal Harbour gold property near Goldboro. Work consisted of additional surface diamond-drilling and extensive drill core analysis.

Seabright Explorations Incorporated, under the direction of Westminer Canada Limited, completed a large-scale surface bulk sampling program on the Moose River gold property (Touquoy zone). Westminer Canada Limited (Seabright Division) also continued a detailed evaluation of the Forest Hill gold property which included additional underground bulk sampling at the Teasdale Mine. The company phased out operations at Forest Hill at the end of September 1989.

Hecla Mining Canada Limited, in a joint venture agreement with Biron Bay Resources Limited, completed the construction of a 125 m shaft on the 'West' zone of the Mooseland gold property early in 1989. Work on the property was suspended mid-year when Biron Bay was unable to continue financing the project.

Inco Gold Management Incorporated continued a large-scale surface exploration program in the McMillan Flowage area of the Cape Breton Highlands consisting of a detailed geological mapping and a large-scale trenching program. Noranda Exploration Company Limited continued detailed work on a property near Whycocomagh, Inverness County, and completed regional surveys to the east of Whycocomagh in the Creignish Hills area.

Carrick Gold Resources Limited carried out detailed geological mapping, trenching and diamond-drilling on the Montague gold property in Halifax County. Onitap Resources Incorporated completed diamond-drilling in the Basin Lake area, Guysborough County, on the east extension of the Upper Seal Harbour anticline. Lixor Incorporated, under an option agreement with Aurtec Mining Development Incorporated, completed an induced polarization (IP) survey and diamond-drilling on the Cranberry Head gold property in Yarmouth County. Seabright Explorations Incorporated carried out ground geophysical surveys and trenching on the Mount Uniacke gold

property in Hants County.

Base Metals. The level of exploration activity for base metals demonstrated a modest increase in 1988 and this trend has continued in 1989 reflecting the shift away from precious metals, particularly by the major companies. Several exploration programs were undertaken in a variety of geological environments both at the grass-roots level and as additional work on known occurrences.

Westminer Canada Limited (Seabright Division) continued a detailed evaluation of the former lead-zinc mine at Gays River which included de-watering the old workings and underground bulk sample tests. The company also completed surface diamond-drilling on two additional properties in the Gays River area.

Falconbridge Limited completed a preliminary drilling program to evaluate the Windsor Group-hosted Jubilee lead-zinc property in Victoria County. The company also completed an airborne geophysical survey, geological mapping and geochemical sampling in the vicinity of the Stirling deposit, Richmond County.

Rio Algom Exploration Incorporated carried out exploration drilling for tin in the vicinity of the company's East Kemptville tin deposit in Yarmouth County. Exploration drilling for tin was also undertaken in the area by Guinness Gold Resources Limited near Pearl Lake. Falconbridge Limited completed detailed ground geophysical surveys near Kempt Snare Lake.

Exploration for gold and base metals was undertaken by several companies in the Cape Breton Highlands area south of Chéticamp, Inverness County, including Noranda Exploration Company Limited (Rocky Brook), Donner Resources Limited (Faribault Brook) and Seabright Explorations Incorporated (Rocky Brook). Work on these properties included geological mapping, geochemical and geophysical surveys, and trenching.

Industrial Minerals. The production of industrial minerals in Nova Scotia represents an important and growing segment of the mining industry and accounts for roughly 45% of the total value of minerals currently produced. Exploration for industrial minerals has demonstrated a modest but steady increase in recent years, reflecting the growth in the industry, and is highlighted by efforts to expand on current reserves as well as locate new deposits.

Georgia Pacific Corporation continued development drilling

on the Sugar Camp gypsum deposit near Port Hawkesbury. The company also completed exploration drilling in the Sugar Camp area as well as in the vicinity of their gypsum quarry at Big Brook. National Gypsum (Canada) Limited completed exploration drilling for gypsum at Dutch Settlement, Halifax County.

Nova Scotia Gypsum Company, a division of Fundy Gypsum Company Limited, completed pre-production studies on the company's proposed new gypsum quarry at Dutch Settlement, Halifax County.

Lafarge Canada Incorporated continued to evaluate potential limestone deposits in the vicinity of its quarry operations near Brookfield, Colchester County. Ridge Brokers Limited carried out diamond-drilling on the Calpo limestone deposit at Southside Antigonish Harbour and on a limestone property at Ohio River, both in Antigonish County.

The development of a new aggregate operation was continued during the year by Kelly Rock Limited near Englishtown, Victoria County, and included diamond-drilling and bulk sample testing. Hecla Mining Company of Canada Limited completed detailed geological mapping and lithological sampling for andalusite at Doughboy Point, Guysborough County, and Pubnico Peninsula, Yarmouth County.

APPENDIX A

Coal Section Publications for 1989-90 Fiscal Year

Calder, J. H. 1989: Allogenic constraints on sites of peat-forming ecosystems in a Late Carboniferous intermontane basin; *in* Mines and Minerals Branch, Report of Activities 1988, Part B, eds. Y. Brown and D. R. MacDonald; Nova Scotia Department of Mines and Energy, Report 89-1, p. 1-3.

Calder, J. H. 1989: Interpretation of ancient peat-forming ecosystems: an example from the Westphalian B (early Middle Pennsylvanian), Cumberland Basin, Nova Scotia; Geological Society of America 1989 Annual Meeting, Abstracts with Programs, p. A27.

Calder, J. H., Gibling, M. R. and Mukhopadhyay, P. K. 1989: Peat formation in a Westphalian B peidmont setting, Cumberland Basin, Nova Scotia; Implications for the maceral-based interpretation of rheotrophic and raised paleomires; Abstracts, 1989 Conference on Coal, Orléans, France; Société Géologique de France.

Calder, J. H. and Gillis, K. S. 1989: Preliminary results of deep coal drilling at South Athol, Cumberland Basin; *in* Mines and Minerals Branch, Report of Activities 1989, Part A, eds. D. R. MacDonald and K. A. Mills; Nova Scotia Department of Mines and Energy, Report 89-3, p. 5-7.

Calder, J. H., Gillis, K. S., MacNeil, D. J., Naylor, R. D. and Smith, W. D. 1989: Current coal geoscience research at the Nova Scotia Department of Mines and Energy; *in* Advances in Western Canada Coal Geoscience, Forum Proceedings; Alberta Research Council, Information Series No. 103, p. 357.

Hacquebard, P. A., Gillis, K. S. and Bromley, D. A. 1989: Re-evaluation of the coal resources of Western Cape Breton Island; Nova Scotia Department of Mines and Energy, Paper 89-3, 56 p.

Hughes, J. D., Watson, P. and MacNeil, D. J. 1989: Database development and computer modelling of Nova Scotia coalfields; *in* Mines and Minerals Branch, Report of Activities 1989, Part A, eds. D. R. MacDonald and K. A. Mills; Nova Scotia Department of Mines and Energy, Report 89-3, p. 17-18.

Kalkreuth, W., Naylor, R., Pratt, K. and Smith, W. 1990: Fluorescence properties of alginite-rich oil shales from the Stellarton Basin, Canada; Fuel, v. 69, p. 139-144.

Mukhopadhyay, P. K., MacDonald, D. J., Naylor, R. D., Smith, W. D., Calder, J. H., Fowler, M. G. and Hatcher, P. G. 1990: Hydrocarbon generation and migration of oil shale, coal and sandstone sequence from Westphalian B-D (Carboniferous) sediments of Stellarton Basin, Nova Scotia; *in* 1990 Colloquium and Symposium on Current Research in the Atlantic Provinces; Atlantic Geoscience Society, Program with Abstracts.

MacNeil, D. J., Naylor, R. D., Cox, B. and Whitman, L. P. 1989: Sedimentology of a lacustrine sequence capping the Harbour Seam, Sydney coalfield; *in* Mines and Minerals Branch, Report of Activities 1989, Part A, eds. D. R. MacDonald and K. A. Mills; Nova Scotia Department of Mines and Energy, Report 89-3, p. 15-16.

Paul, J., Kalkreuth, W., Naylor, R. and Smith, W. 1989: Petrology, Rock-Eval and facies analyses of the McLeod coal seam and associated beds, Pictou coalfield, Nova Scotia, Canada; Atlantic Geology, v. 25, p. 81-92.

Ryan, R. J., Boehner, R. C., Deal, A. and Calder, J. H. 1990: Cumberland Basin preliminary geology, Amherst, Springhill and Parrsboro; Nova Scotia Department of Mines and Energy, Open File Map 90-002, scale 1:50 000.

Smith, W. D. 1989: Progress report on a study of trace and major elements in Nova Scotia coals; *in* Mines and Minerals Branch, Report of Activities 1989, Part A, eds. D. R. MacDonald and K. A. Mills; Nova Scotia Department of Mines and Energy, Report 89-3, p. 9-13.

Smith, W. D., Gillis, K. S. and Montgomery, S. A. 1989: Geology-Stellarton Basin (west half), Pictou County, Nova Scotia; Nova Scotia Department of Mines and Energy, Open File Report 89-016, 88 p.

Smith, W. D., Gillis, K. S. and Montgomery, S. A. 1989: Geological map of the Stellarton Basin (west half), Pictou County, Nova Scotia (1:5000); Nova Scotia Department of Mines and Energy, Open File Map 89-017.

Smith, W. D., Naylor, R. D. and Kalkreuth, W. D. 1989: Oil shales of the Stellarton Basin, Nova Scotia, Canada; stratigraphy, composition,

depositional environment and potential uses; *in* Proceedings, 22nd Annual Oil Shale Symposium; Colorado School of Mines, Golden, Colorado, 19-20 April 1989, p. 20-38.

The following building stone reports were made public in 1989:

Dickie, G. B. 1989: Nova Scotia dimension stone for designers, developers and quarriers; Nova Scotia Department of Mines and Energy, Information Series 19.

Dickie, G. B. 1989: Nova Scotia dimension stone for designers, developers and quarriers; Nova Scotia Department of Mines and Energy, Sample Catalogue No. 89-001.

Dickie, G. B. 1989: Summary report on quarry stone used in the construction of the Dominion Building, Halifax, Nova Scotia; Nova Scotia Department of Mines and Energy, Open File Report 89-006.

APPENDIX B

Production Information From Mines, Quarries and Other Operations

The mining industry in Nova Scotia employs more than 5,600 people (Fig. B-1) who produce mineral commodities valued at an estimated $500 million (Fig. B-2). Historical trends in mineral commodity value are shown in Figure B-3.

In this appendix each production site is described. Table B-1 gives a summary of Nova Scotia's mineral production for 1989; Tables B-2 to B-7 provide more detailed information on production. Site locations are shown on the accompanying maps, Figures B-4 and B-5. Production data are for the calendar year 1 January 1989 to 31 December 1989.

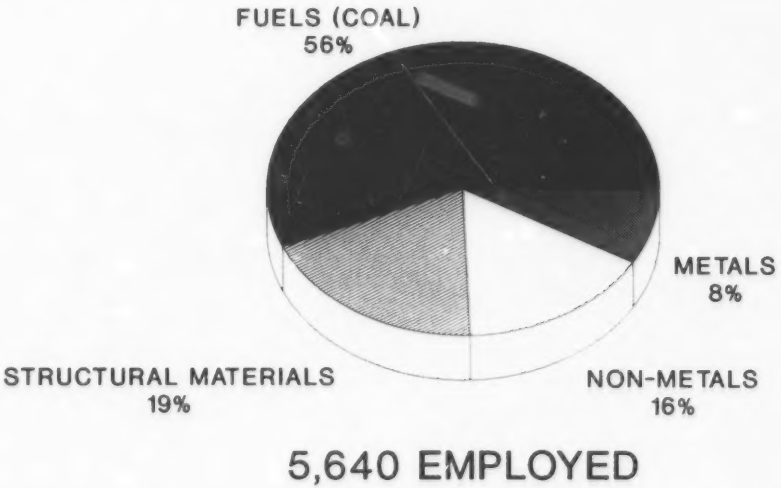


Figure B-1. Employment by mineral commodity as a percentage of total employment.

METAL MINES AND GOLD MINES

Gold

Coxheath Gold Holdings Ltd. operated their gold property at

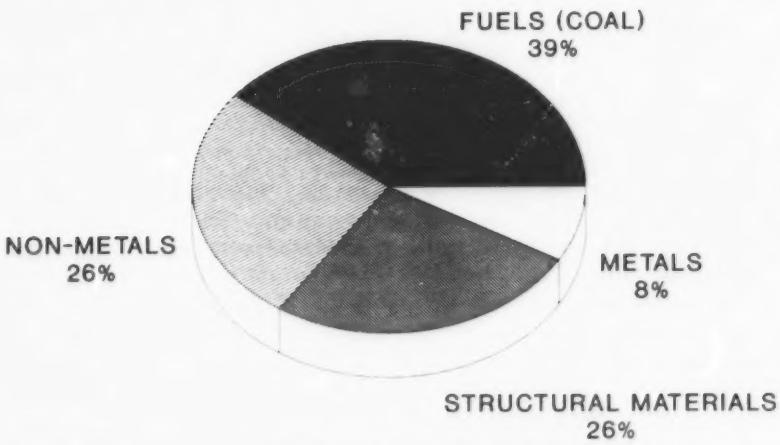


Figure B-2. Value of mineral commodity groups as a percentage of the total value of mineral production.

Tangier for part of the year under a mining lease. Three companies continued to operate on exploration licenses with permits for extracting bulk samples to assess grades and gold recovery. Westminer Canada Ltd. reported 6,971 troy oz. from their Forest Hill, Guysborough County, and Moose River and Beaver Dam, Halifax County, properties. NovaGold Resources Inc. reported 120 oz. from their Cochrane Hill property. Antioch Resources Ltd. extracted 800 tons of ore from the Caribou property but did not process it during the year.

COXHEATH GOLD HOLDINGS LIMITED

Manager:	Wm. Rodgers (at closure)
Address:	Tangier Mine, P. O. Box 28
	Tangier, N. S. B0J 3H0
Production:	1,160 troy oz.
Employees:	115 (prior to closure)

The mine ceased production in June 1989. At year end, efforts were being made to re-open the mine.

Metal Mines

There are two base metal producers. Details of the operations are given below. Production is shown in Table B-2.

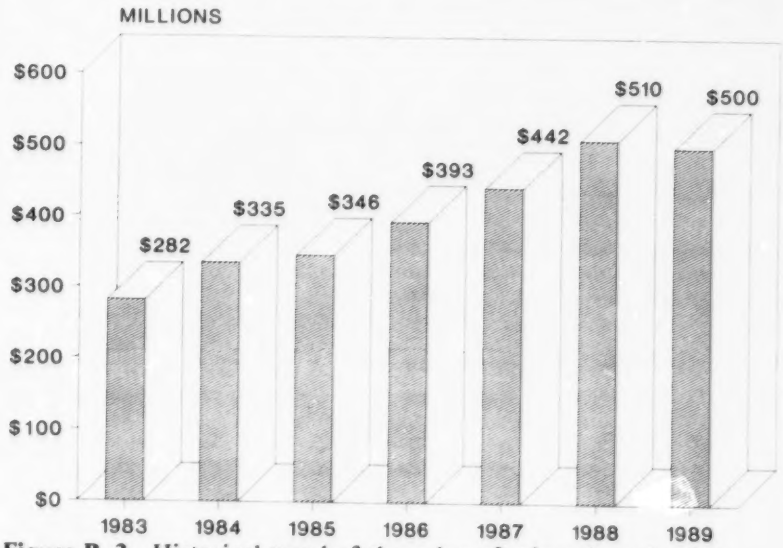


Figure B-3. Historical trend of the value of mineral production.

RIO KEMPTVILLE TIN CORPORATION

Manager: K. Collison
Address: P. O. Box 6
East Kemptville, N. S. B0W 1Y0
Production: 3,815 tons (3 461 tonnes) tin in concentrate
338 tons (306 tonnes) copper in concentrate
556 tons (504 tonnes) zinc in concentrate
11,084 oz. (344.7 kg) silver in concentrate
Employees: 232

Metallurgical research was conducted and changes were made to the mill flowsheet to increase capacity and improve the recovery of tin and base metals. A new tin flotation circuit was commissioned in May 1989 and flotation columns were installed in the sulphide recovery circuit. Test work is continuing to determine if a Kelsey Jig can improve recovery of tin.

WESTMINER CANADA LTD.
(Gays River Mine)

Manager: D. B. Armstrong
Address: Gays River Mine
R. R. #1, Milford Station
Hants County, N. S. B0N 1Y0

Production: Mine under development

Westminer Canada Ltd. dewatered the underground mine at Gays River, Halifax County, to investigate the feasibility of re-opening the mine. The mine had been closed by its previous owner, Esso Minerals, in 1982. Westminer Canada Ltd. extracted 20 000 tonnes of ore to test various mining methods and to do test milling of the ore. The mining and milling tests were successful. By year end the company had decided to put the mine back into production and had applied for a mining lease.

COAL MINING OPERATIONS

During April 1989 there were four underground coal mines, three open pit mines and three coal dump reclamation plants in operation. Table B-3 summarizes production information for the coal mines.

Underground Coal Mines

EVANS COAL MINES LTD.

Manager:	G. Evans
Address:	R. R. # 1 Inverness, N. S. B0E 1N0
Production:	41,385 tons (37 544 tonnes) coal
Employees:	44

The St. Rose Colliery, Inverness County, is owned and operated by Evans Coal Mines Ltd. Production is from development headings or from room and pillar mining followed by pillar recovery.

CAPE BRETON DEVELOPMENT CORPORATION

Manager:	Robert Cooper Vice President, Mining Operations
Address:	P. O. Box 2500 Sydney, N. S. B1P 6K9
Sales Plus Internal Use:	3,473,303 tons (3 150 960 tonnes)
Employees:	2,989

The Cape Breton Development Corporation is a federal crown corporation that operates three producing underground coal mines in Cape Breton County. The Corporation has suspended the development of the Donkin Mine; however, the workings were still being maintained at year end.

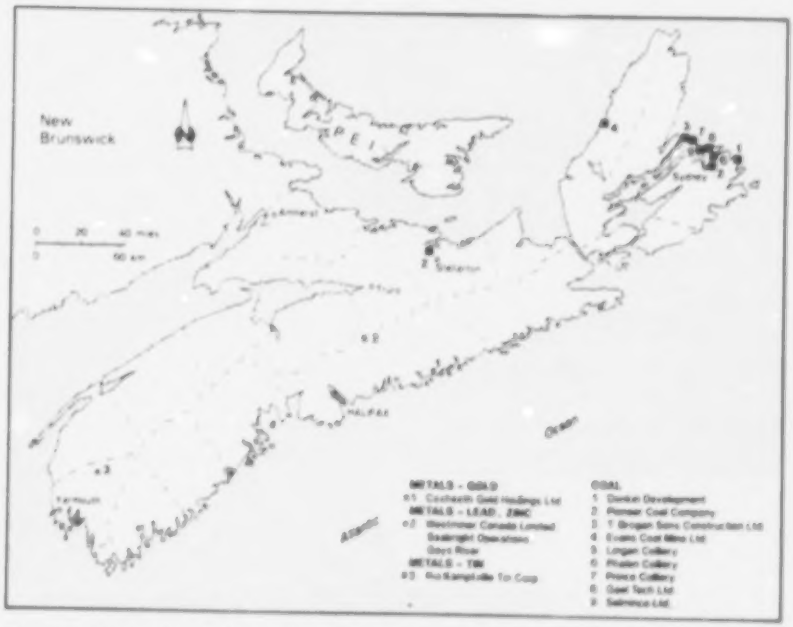


Figure. B-4. Locations of metal mines and coal mines.

Lingan Colliery

Raw Coal Production: 714,767 tons (648 424 tonnes)

This mine is located at Lingan near New Waterford, Cape Breton County. Coal is recovered from three mechanized advance longwall panels.

Longwall panels No. 7 West and No. 11 East worked all year. Longwall panel No. 12 East started production on 21 August 1989, and longwall panel No. 10 East had its final survey on 23 January 1990.

The Corporation is planning to convert the mine from advance longwall to pillarless retreat longwall method. This change is expected to improve the productivity of the mine considerably.

Phalen Colliery

Raw Coal Production: 776,813 tons (704 912 tonnes)

The Phalen Colliery near New Waterford, Cape Breton County, commenced production in 1987. The coal is extracted by mechanized retreat longwall method. Longwall panel No. 1 West ceased production on 5 June 1989, the No. 2 West longwall panel commenced production on 3 October 1989, the No. 2 East longwall panel was started on 1 May 1989 and finished production on 3 November 1989, and the No. 3 East longwall panel started production on 9 January 1990. Development work is underway to establish longwall panels No. 4 East and No. 3 West.

Prince Mine

Raw Coal Production: 1,293,884 tons (1 173 793 tonnes)

This mine is located at Point Aconi, Cape Breton County. The coal is extracted by mechanized retreat longwall method. Coal extraction was completed from the No. 8 East longwall panel on 19 May 1989 and from the No. 7 West longwall panel on 11 December 1989. Coal production commenced from the No. 8 West longwall panel on 19 October 1989 and the development work to establish the No. 9 West longwall panel was almost complete at year end.

WESTRAY COAL INC.

Manager: G. Phillips
Address: R. R. #2, New Glasgow
N. S. B2H 5C5
Production: Mine under development

The company proposes to establish a 1,102,300 tons (1 000 000 tonnes) per year coal mine at its site on Highway 348 at Plymouth near New Glasgow, Pictou County.

The mine portals have been established, one access tunnel has been driven for approximately 100 m and the other for 30 m. At year end work on the site had been suspended until the various funding agreements for the project have been verified and signed.

Surface Coal Mines

PIONEER COAL CO. (Westville, Pictou County)

Manager: D. Cook
Address: P. O. Box 929
Westville, N. S. B0K 2A0

Production: 133,130 tons (120 775 tonnes) coal
Employees: 40

During the year coal was mined from the Acadia seam in the area of the Drummond Path, and from the Scott seam near the intersection of the Foxbrook and Drummond Roads. The Foxbrook Road was temporarily re-aligned. Exploration for the extension of the Acadia seam to the east of the former workings was disappointing. The coal quality was too poor for the seam to be worked.

The company operated a heavy media coal wash plant to upgrade coal waste dump material. Reclamation of the Drummond and Acadia dumps continued until late December when operations were suspended for the winter.

PIONEER COAL CO. (Reserve Mines, Cape Breton County)

Manager: D. Brown
Address: P. O. Box 150
Sydney Mines, N. S. B0A 1Z0
Production: 139,948 tons (126 960 tonnes) coal
Employees: 42

The mine is located east of Reserve Mines, Cape Breton County, near the Sydney Airport. The coal is mined from the Gardiner and O'Dell seams by conventional open pit methods. The operation includes a 100 tons/hr. (90 tonnes/hr.) heavy media wash plant.

T. BROGAN & SONS CONSTRUCTION LTD.

Manager: T. Brogan
Address: P.O. Box 199
Florence, N. S. B0C 1J0
Production: 27,680 tons (25 111 tonnes) coal
Employees: 12

The company operates an open pit coal mine at Point Aconi, Cape Breton County. The overburden is removed by a dragline excavator. The exposed coal is ripped with a bulldozer and loaded into trucks with a front-end loader. The coal reserves on this property are nearly exhausted and the mine is expected to close next year.

Coal Reclamation Plants

GUILDCRAFT/GAEL TECH INC.

Manager: Tony Fisher
Address: Pitt St., Sydney Mines
Cape Breton County, Nova Scotia B1V 2Y4
Production: 46,200 tons (41 912 tonnes) reclaimed coal
Employees: 30

This company operates a plant to reclaim coal from the fines previously discarded by the Sydney Mines wash plant.

COASTAL CONSTRUCTION

Manager: D. MacLeod
Address: P. O. Box 326, Lower Sydney
Cape Breton County, N. S. B2A 3M4
Production: 27,023 tons (24 515 tonnes) reclaimed coal
Employees: 28

This company has recommissioned the coal reclamation plant previously operated by Selminco at the Pitt St. site in Sydney Mines. The plant was operated on an intermittent basis throughout the year.

INDUSTRIAL MINERALS MINING

Industrial minerals form a significant part of the total mineral production in Nova Scotia. Sixteen industrial mineral producers operating at 27 sites produce gypsum, salt, anhydrite, limestone, barite, dolomite, clay and shale, silica sand, peat and dimension stone.

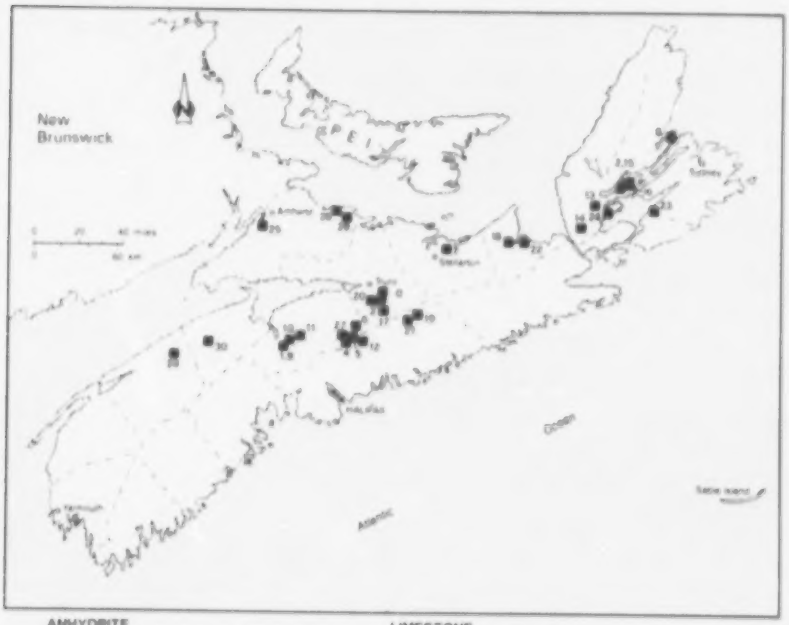
Table B-4 summarizes production information. Additional information about secondary manufacturing is given in Table B-5.

Numerous aggregate producers, operating in both granular and bedrock deposits, supply the provincial requirements while two companies, Construction Aggregates Limited and Permanent Concrete Ltd., supply aggregate to the export market.

Gypsum and Anhydrite

DOMTAR GYPSUM LTD.

Manager: S. G. Johnson



ANHYDRITE
1. Fundy Gypsum Co., Ltd.
2. Little Narrows Gypsum Co., Ltd.

BARITE
3. Nystone Chemicals Ltd.

CLAY AND SHALE
4–7. L. E. Shaw Ltd.

DOLOMITE
8. Scotia Limestone Ltd.

GYPSUM
9–10. Fundy Gypsum Co., Ltd.
11. Domtar Construction Materials
12. National Gypsum Canada Ltd.
13–14. Georgia-Pacific Corp.
15–16. Little Narrows Gypsum Company Ltd.
17. Lafarge Canada Ltd.
18. Nova Construction Ltd.
19. Mosher Ltd.

LIMESTONE
20. Lafarge Canada Inc.
21. Mosher Limestone Ltd.
22. Ridge Brokers Ltd.
23. Scotia Limestone Ltd.
24. Nova Scotia Sand and Gravel Ltd. (Marble)

SALT
25. Sifto Salt Division, Domtar Chemical Group
26. Canadian Salt Company Ltd.

SILICA SAND
27. Nova Scotia Sand and Gravel Ltd.

STONE
28. Heritage Memorials
29. Wallace Quarries Ltd.

PEAT MOSS
30. Annapolis Valley Peat Moss Co.

Figure B-5. Locations of industrial mineral, dimension stone and peat moss operations.

Address:	P.O. Box 758 Windsor, N. S. B0N 2T0
Production:	10,636 tons (9 649 tonnes) gypsum
Employees:	4 (Mine); 12 (Plant)

Domtar Gypsum Ltd. owns a quarry at MacKay Settlement, Hants County, where mining is carried out by a contractor. The gypsum is calcined at a plant in Windsor, Hants County, to produce plaster products.

FUNDY GYPSUM CO. LTD.

Manager: G. Raymond
Address: P.O. Box 400
Windsor, N. S. B0N 2T0
Production: 69,826 tons (63 346 tonnes) anhydrite; 1,852,406 tons (1 680 492 tonnes) gypsum
Employees: 201

The Fundy Gypsum Co. Ltd. operates two quarries and crushing plants located in the Wentworth Creek and Miller Creek areas near Windsor, Hants County. The company produced gypsum from its Miller Creek quarry and both gypsum and anhydrite from the Wentworth Creek quarry. The anhydrite is processed in the company's heavy media plant to separate the anhydrite from the gypsum. After mining, the gypsum is crushed and transported via unit train to shiploading facilities at Hantsport for shipment to wallboard and cement plants in the United States.

The company is in the advanced stage of planning for a new quarry near Dutch Settlement, Halifax County, which will be operated with a subsidiary company to be called Nova Scotia Gypsum Ltd.

GEORGIA PACIFIC CORPORATION

Manager: J. Graham
Address: P.O. Box 400
Port Hawkesbury, N. S. B0E 2V0
Production: 874,860 tons (793 668 tonnes) gypsum
Employees: 73

Georgia Pacific Corporation operates two gypsum quarries in Inverness County. The River Denys quarry continued operations with the product being transported by rail to shiploading facilities at Point Tupper. Gypsum produced from the Sugar Camp Lake quarry, which is approximately eight miles (10 km) southwest of the River Denys quarry, is transported by truck to Point Tupper.

LITTLE NARROWS GYPSUM COMPANY LTD.

Manager: T. H. Davis
Address: Little Narrows
N. S. B0E 1T0
Production: 66,675 tons (60 487 tonnes) anhydrite; 947,878 tons (859 909 tonnes) gypsum

Employees: 91

Little Narrows Gypsum Company Ltd. operates two gypsum quarries and one anhydrite quarry near Little Narrows, Victoria County. All the gypsum and anhydrite produced is shipped from the company's dock on St. Patrick's Channel in the Bras d'Or Lakes to destinations in Canada and the United States.

NATIONAL GYPSUM (CANADA) LTD.

Manager: P. Mills
Address: P.O. Box 637
Dartmouth, N. S. B2Y 3Y9
Production: 3,480,129 tons (3 157 152 tonnes) gypsum
Employees: 116

National Gypsum operates the largest gypsum quarry in the province at East Milford, Halifax County. This quarry is the single largest gypsum quarry in the western world. The company transports the gypsum by unit train from Milford to Wright's Cove, Dartmouth, where it is loaded on ships bound for points in Canada and the United States.

NOVA CONSTRUCTION LTD.

President: John Chisholm
Address: P. O. Box 1328, Antigonish
N. S. B2G 2L7
Production: 81,313 tons (73 767 tonnes) gypsum
Employees: 4

The company operates a small quarry at Brierly Brook, Antigonish County. Some of the output is sold to Lafarge Canada Inc. for use in the cement plant near Brookfield, Colchester County, and the remainder is exported from the company's dock at Aulds Cove, Guysborough County.

Salt

CANADIAN SALT COMPANY LTD.

Manager: Wm. McCormick
Address: P.O. Box 160
Pugwash, N. S. B0K 1L0
Production: 1,095,501 tons (993 832 tonnes) salt

Employees: 200

The Canadian Salt Company mine is located near Pugwash, Cumberland County. A room and pillar system of extraction is employed using trackless diesel and electric equipment. Salt production was from the 730 and the 830 ft. levels, and the 1,000 ft. level is being developed for future production. The processing plant onsite produces industrial grades of salt, blocks for farm use and refined salt for domestic consumption. The industrial grades are supplied in bulk for truck transportation, bagged for rail transportation or transported in bulk or bags to storage and shiploading facilities at the Pugwash Harbour wharf.

SIFTO SALT INC.

Manager: J. Trebish
Address: P.O. Box 550
Amherst, N. S. B4H 4A1
Production: 109,800 tons (99 610 tonnes) salt
Employees: 85

Domtar Chemicals Group, Sifto Salt Division, has operated a solution salt mine near Nappan, Cumberland County, since 1947. The total salt production to date is over 3 000 000 tonnes. Six 'brine wells' have been drilled since the start of production. Current production is from the No. 6 well and the location for the No. 7 well has been selected. Salt is recovered from the brine using the 'mechanical vapour recompression evaporating process' system. On 30 March 1990 the mine was sold to Sifto Canada Inc., a subsidiary of Carey Salt Holdings Inc.

Barite

NYSTONE CHEMICALS LTD.

Manager: V. Prostak
Address: P.O. Box 64
Debert, N. S. B0M 1G0
Production: 862 tons (782 tonnes) pharmaceutical quality barite
Employees: 16

The barite ore is mined and crushed by a contractor at the mine site northeast of Brookfield, Colchester County. The ore is then shipped to the company's plant at Debert where it is upgraded to a pharmaceutical quality product which is shipped to E-Z-M

Corporation, New York, USA, for further processing and packaging.

Limestone and Dolomite

LAFARGE CANADA INC.
(Formerly Canada Cement Lafarge Ltd.)

Manager: G. Langford
Address: P.O. Box 5
Brookfield, N. S. B0N 1C0
Production: 746,073 tons (676 833 tonnes) limestone
Employees: 12 (Quarry); 85 (Cement Plant)

Lafarge Canada Inc. operates a limestone quarry and cement manufacturing plant at Brookfield, Colchester County. The total production from the quarry is processed at the cement plant.

MOSHER LIMESTONE LTD.

Manager: R. Mosher
Address: P.O. Box 28
Upper Musquodoboit, N. S. B0N 2M0
Production: 119,048 tons (108 000 tonnes) limestone
Employees: 24

Mosher Limestone operates two quarries near Upper Musquodoboit, Halifax County, and one quarry near Cooks Brook, Halifax County. The company produces agricultural grade dolomitic limestone in its grinding plant at Upper Musquodoboit. The product is bagged or supplied in bulk distribution throughout the Atlantic Provinces for use as a soil conditioner. The mine lease on the Upper Musquodoboit deposit was renewed in 1989.

RIDGE BROKERS LTD.

Manager: A. Alward
Address: P.O. Box 59
Havelock, N. B. E0A 1W0
Production: 9,721 tons (8 819 tonnes) limestone
Employees: 6

The company operates a small quarry at South Side, Antigonish Harbour, Antigonish County. The limestone is sold almost exclusively to Scott Paper Company, with a small quantity sold for agricultural use.

SCOTIA LIMESTONE LTD.

Manager:	J. D. Coffin
Address:	P.O. Box 457 Sydney, N. S. B1P 6H4
Production:	Kellys Cove: 11,405 tons (10 347 tonnes) dolomite Irish Cove: 6,851 tons (6 215 tonnes) limestone
Employees:	13

The company operates limestone quarries at Irish Cove, Cape Breton County, and at Kellys Cove, near New Campbellton, Victoria County. The Kellys Cove quarry is operated by Mosher Limestone Ltd. to produce agricultural grade dolomite. The Irish Cove quarry is operated periodically by a contractor.

Clay, Shale, Industrial Sand, Marble

L. E. SHAW LTD. (NOVA SCOTIA SAND AND GRAVEL)

President:	A. Shaw
Address:	5251 Duke Street Halifax, N. S. B3J 1P3
Production:	43,761 tons (39 700 tonnes) clay & shale 31,967 tons (29 000 tonnes) industrial sand 11,023 tons (10 000 tonnes) marble
Employees:	14

L. E. Shaw and its subsidiary company, Nova Scotia Sand and Gravel, operate seven properties in Nova Scotia. The clay and shale are quarried from pits at Lantz, Milford and Shubenacadie, all in Hants County, and from a quarry near New Glasgow, Pictou County. The materials quarried are used in the company plant located in Lantz, Hants County, for the manufacture of bricks and tiles. The company also produces industrial sand at Elmsdale, Brazil Lake and Sandy Desert, all in Hants County, and architectural limestone from a quarry at Marble Mountain, Inverness County.

AGGREGATE RESOURCES

Production information for crushed stone, and sand and gravel is summarized in Table B-6.

Crushed Stone

The province had 16 rock quarry operations in production which

produced a total of 7,853,000 tons (7 124 000 tonnes) in 1989 and employed 360 people.

Sand and Gravel

There were 60 producers of sand and gravel operating in the province, employing 538 people. Total production, which includes production by the Nova Scotia Department of Transportation and Communications, was 8,796,200 tons (7 979 900 tonnes).

MISCELLANEOUS MATERIALS PRODUCTION

The production of miscellaneous materials is shown in Table B-7.

Dimension Stone

HERITAGE MEMORIALS LTD.

Owner: G. Nelson
Address: P.O. Box 308
Windsor, N. S. B0N 2T0
Production: 474 tons (430 tonnes) granite
Employees: 21

The company periodically operates a small quarry at Nictaux West, Annapolis County. The grey granite is used as dimension stone at the company's memorial manufacturing plant at Windsor, Hants County.

ARSENAULT MONUMENT WORKS LTD.

Owner: P. Arsenault
Address: P.O. Box 1475
Antigonish, N. S. B3B 2L4

Arsenault Monument Works Ltd. periodically operates a quarry at Loch Katrine, Antigonish County, for the production of dimension stone used in memorials. No production was recorded in 1989.

WALLACE QUARRIES LTD.

Owner: S. Flynn
Address: P. O. Box 203, Wallace
Cumberland County, N. S. B0K 1Y0
Production: 403 tons (366 tonnes) building stone

Employees: 6

The Wallace Quarries continued during the year to supply building stone for major building rehabilitation work in Halifax, Sydney and Ottawa.

Peat Moss

ANNAPOLIS VALLEY PEAT MOSS CO.

President: H. Endres
Address: Berwick, N. S. B0P 1E0
Production: 7,275 tons (6 600 tonnes) peat moss
Employees: 40 (some part-time)

The company uses vacuum harvesters to recover agricultural peat from a 500 acre (200 ha) bog located near Berwick, Kings County.

Table B-1. Summary of Nova Scotia mineral production, 1988 and 1989.

	----- 1989 -----		----- 1988 -----	
DESCRIPTION	VALUE '000$[1]	EMPLOYMENT*	VALUE '000$[1]	EMPLOYMENT*
Metals				
Copper	1,038		1,397	
Gold	3,726		3,970	
Silver	72		141	
Tin	35,887		33,739	
Zinc	1,085		203	
Total Metals	41,810	471	39,450	464
Non-metals				
Anhydrite	1,597		1,701	
Barite	983**		1,110**	
Dolomite	240		296	
Gypsum	60,070		64,311	
Limestone[2]	1,646		1,641	
Peat moss	1,073**		1,104**	
Salt	64,100**		51,585**	
Silica	2,030**		1,900**	
Total Non-Metals	131,740	905	123,650	904
Fuels				
Coal	196,430		213,450	
Total Fuels	196,430	3,185	213,450	3,552
Structural Materials				
Building - Ornamental Stone	774		557	
Cement	53,560**		54,000**	
Clay Products	6,735**		7,350**	
Plaster Products	1,814**		1,800**	
Crushed Stone	35,622		28,704	
Sand & Gravel	31,920		41,000	
Total Structural Materials	130,430	1,079	133,410	1,028
TOTAL MINERAL PRODUCTION	500,000	5,640	510,000	5,950
CHANGE FROM PREVIOUS YEAR	-2%	-5%	+15%	+1%

[1]Estimated from Department of Mines and Energy sources.
[2]Does not include the value of gypsum quarried for plaster products.
[3]Does not include the value of limestone quarried for cement production.
*Average number of persons during production period.
**Processed or manufactured value.
Note: Production represents shipments; sum of components may not add due to rounding.

Table B-2. Metallic mineral production for the calendar year 1989.

COMPANY	LOCATION	PRODUCTION		TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
COPPER					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	675,163 (lbs.) (copper - in - concentrate)	306 249 kg	3	1,038,400
GOLD					
Coxheath Gold Holdings Limited	Tangier, Halifax County	1,160 (troy ozs.)	36 080 g	115	523,900
Westminer Canada Limited	Forest Hill, Guysborough County Beaver Dam, Halifax County Moose River, Halifax County	6,971 (troy ozs.)	250 756 g	123	3,148,200
Other	Various	120 (troy ozs.)	3 732 g	1	54,200
	TOTAL (gold)	4,464 (troy ozs.)	138 846 g	239	3,726,300
SILVER					
Coxheath Gold Holdings Limited	Tangier, Halifax County	24 (troy ozs.)	746 g	3	156
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	11,094 (troy ozs.)	344 751 g	3	72,200
Westminer Canada Limited	Forest Hills, Guysborough County	10 (troy ozs.)	311 g	3	65
	TOTAL (silver)	11,118 (troy ozs.)	345 808 g	3	72,400
TIN					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County	7,629,134 (lbs.) (tin - in - concentrate)	3 460 517 kg	232	35,887,400
ZINC					
Rio Kemptville Tin Corp.	East Kemptville, Yarmouth County (zinc - in - concentrate)	1,111,557 (lb.)	504 194 kg	3	1,084,900
TOTAL FOR METALLIC MINERAL PRODUCTION				471	41,809,400

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimated value based on average annual metal price times volume
[3]included elsewhere
NOTE - production represents shipments; sum of components may not add due to rounding

Table B-3. Coal production for the calendar year 1989.

COMPANY	MINE NAME	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
UNDERGROUND MINING						
Cape Breton Development Corp. (CBDC)	Prince Mine	Point Aconi, Cape Breton County	3,473,303	3 150 960	2,989	176,322,800
	Phalen Mine	Lingan, Cape Breton County				
	Lingan Mine	Lingan, Cape Breton County				
Evans Coal Mines Ltd.		St. Rose, Inverness County	41,385	37 544	44	2,063,979
		TOTAL (underground)	3,514,688	3 188 504	3,033	178,386,779
OPEN PIT MINING						
T. Brogan & Sons Construction Ltd.		Point Aconi, Cape Breton County	27,680	25 111	12	925,888
Pioneer Coal Limited		Westville, Pictou County	133,130	120 775	40	6,195,223
		Reserve Mines, Cape Breton County	139,948	126 960	42	7,203,892
		TOTAL (open pit)	300,758	272 846	94	14,325,003
RECLAMATION						
Gael Tech Inc./Guildcraft		Sydney Mines, Cape Breton County	46,200	41 912	30	2,433,325
Coastal Construction & Excavation Ltd.		Sydney Mines, Cape Breton County	27,023	24 515	28	1,284,613
		TOTAL (reclamation)	73,223	66 427	58	3,717,938
TOTAL FOR ALL COAL PRODUCERS			3,888,668	3 527 777	3,185	196,429,700

[1]personnel employed in clerical, supervisory, etc., positions as well as mining personnel
[2]estimated from Nova Scotia Department of Mines and Energy sources
NOTE - production represents shipments; sum of components may not add due to rounding

Table B-4. Industrial minerals production for the calendar year 1989.

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
GYPSUM					
Domtar Gypsum	Windsor, Hants County	10,636	9 649	4	
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth Road, Hants County	1,852,406	1 680 492	201	
Georgia-Pacific Corp.	River Denys and Sugar Camp, Inverness County	874,860	793 668	73	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	947,878	859 909	91	
National Gypsum (Canada) Ltd.	Milford, Halifax County	3,480,129	3 157 152	116	
Nova Construction Limited	Brierly Brook, Antigonish County	81,313	73 767	4	
	TOTAL (gypsum)	7,247,222	6 574 637	489	60,070,000
ANHYDRITE					
Fundy Gypsum Co. Ltd.	Miller Creek, and Wentworth Road, Hants County	69,826	63 346	see gypsum	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	66,675	60 487	see gypsum	
	TOTAL (anhydrite)	136,501	123 833		1,597,000
SALT					
Canadian Salt Co. Ltd.	Pugwash, Cumberland County	1,095,501	993 832	200	
Sifto Salt Division Domtar Chemical Group	Nappan, Cumberland County	109,800	99 610	85	
	TOTAL (salt)	1,205,301	1 093 442	285	84,100,000[3]
LIMESTONE					
Lafarge Canada Inc.	Brookfield, Colchester County	746,073	676 833	12	
Mosher Limestone Co. Ltd.	Upper Musquodoboit, Halifax County	119,048	108 000	24	
Ridge Brokers Ltd.	Southside Harbour, Antigonish County	9,721	8 819	6	
Scotia Limestone Ltd.	Irish Cove, Cape Breton County	6,851	6 215	13	
	TOTAL (limestone)	881,693	799 867	55	1,646,000

Table B-4. (cont'd)

DOLOMITE						
Scotia Limestone Ltd.	Kellys Cove, Victoria County	TOTAL (dolomite)	11,405	10 347	12	240,000
BARITE						
Systems Chemicals Ltd.	Brookfield, Colchester County	TOTAL (barite)	802	782	16	1,031,000[3]
CLAY						
L. E. Shaw Ltd.	Lantz, Halifax County Shubenacadie, Halifax County		30,644	27 800	2	0[4]
SHALE						
L. E. Shaw Ltd.	Milford, Hants County New Glasgow, Pictou County		19,117	11 900	2	0[4]
		TOTAL (clay and shale)	49,761	39 700	4	0[4]
SILICA SAND						
Nova Scotia Sand and Gravel (Division of L. E. Shaw Ltd.)	Nine Mile River, Hants County	TOTAL (silica sand)	31,967	29 000	7	2,030,000[3]
TOTAL FOR INDUSTRIAL MINERALS			9,558,713	8 671 608	860	130,714,000

[1]otal employees: mining, production, clerical, supervisory, etc.
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value
[4]value assigned to the higher manufactured valuation (bricks)
NOTE - production represents shipments; sum of components may not add due to rounding

Table B-5. Secondary mineral manufacturing for the calendar year 1989.

COMPANY	LOCATION	TONS PRODUCTION	TONNES	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2]($)
MANUFACTURED BRICKS					
L. E. Shaw Ltd.	Lantz, Halifax County	16,520,533 (bricks)		55	6,734,800
PLASTER PRODUCTS					
Domtar Gypsum	Windsor, Hants County	11,023 (tons)	10 000 (tonnes)	12	1,814,000
PORTLAND CEMENT					
Lafarge Canada Inc.	Brookfield, Colchester County	454,148 (tons)	412 000 (tonnes)	85	53,560,000
TOTAL FOR SECONDARY MINERAL MANUFACTURING				152	62,108,800

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources
NOTE - production represents shipments; sum of components may not add due to rounding

Table B-6. Aggregate materials production for the calendar year 1989.

COMPANY	LOCATION	PRODUCTION TONS	PRODUCTION TONNES	NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
Crushed Stone					
1. Archibald Drilling Supplies Ltd.	Upper Musquodoboit, Halifax County	12,401	11 250	2	
2. Coastal Construction & Excav. Ltd.	Frenchvale, Cape Breton County	10,841	10 000	10	
3. Conrad Brothers Ltd.	Montague, Halifax County	1,186,228	1 076 139	60	
4. Construction Aggregates Ltd.	Mulgrave, Guysborough County	1,483,617	1 355 000	64	
5. Doug Burns Excavation Contr. Ltd.	Sydney, Cape Breton County	68,445	63 000	6	
6. Gateway Materials Ltd.	Kearney Lake Rd., Halifax County	641,637	582 080	10	
7. L. M. Gallant Const. Truck. Ltd.	Elmsdale, Hants County	168,652	153 000	8	
8. Jerry S. Coulter Ltd.	Wallace, Cumberland County	10,009	9 080	3	
9. Levatte Construction Co. Ltd.	Sydney, Cape Breton County	74,640	67 713	16	
10. Permanent Concrete Ltd.	Folly Lake, Cumberland County	420,126	381 136	14	
11. Rio Kemptville Tin Corp.[3]	Kemptville, Yarmouth County	5,421	4 916	--	
12. Rocky Lake Quarry Ltd.	Bedford, Halifax County	3,086,440	2 800 000	120	
13. South Shore Sand & Gravel Ltd.	Bridgewater, Lunenburg County	214,850	194 911	11	
14. Stanley J. Flynn Trucking Ltd.	Wallace, Cumberland County	5,512	5 000	7	
15. S. W. Weeks Construction Ltd.	New Glasgow, Pictou County	418,636	379 784	28	
16. W. Eric Whebby Ltd.	Dartmouth, Halifax County	25,766	23 373	4	
	T O T A L (crushed stone)	7,853,200	7 124 400	360	35,622,000
Sand and Gravel					
17. Aberdeen Paving Ltd.	Halifax, Halifax County	516,521	468 585	38	
18. Acadia Road Contractors Ltd.	Bridgewater, Lunenburg County	174,824	158 590	12	
19. Atlantic Paving Limited	Saulnierville, Digby County	38,381	34 828	13	
20. Bert Balcom Excavating	Middleton, Annapolis County	8,818	8 000	3	
21. Budget Paving Ltd.	Liverpool, Queens County	8,482	7 695	3	
22. C. A. Williams & Sons Ltd.	Windsor, Hants County	48,147	44 586	3	
23. Carson Enterprises Ltd.	Antigonish, Antigonish County	14,330	13 000	2	
24. Chiasson Brothers Ltd.	Chéticamp, Inverness County	4,409	4 000	2	
25. Colin R. Macdonald ltd.	Antigonish, Antigonish County	255,123	231 446	23	
26. Cumberland Paving & Contr. Ltd.	Amherst, Cumberland County	174,163	158 000	8	
27. Davis, L.	Mount Uniacke, Hants County	74,998	68 038	2	
28. Deveau, Willard	Metegan River, Digby County	165,345	150 000	5	
29. Dexter Construction Co. Ltd.	Bedford, Halifax County	444,684	403 415	3	
30. Dillman Enterprises Limited	Shubenacadie, Colchester County	842,157	764 000	22	
31. D.W. Matheson & Sons Ltd.	Little Narrows, Victoria County	5,512	5 000	8	
32. Earle Toole Trucking Ltd.	Truro, Colchester County	27,558	25 000	4	
33. E.B. Hill & Son Limited	Truro, Colchester County	5,450	4 944	5	
34. Gays River Aggregates Limited	Arndale, Halifax County	165,345	150 000	6	
35. G. & E. Thimot Excavation Ltd.	Saulnierville, Digby County	44,092	40 000	4	
36. Gus D'Eon Excavating & Trucking	West Pubnico, Yarmouth County	44,643	40 500	3	
37. Heckett Canada Ltd.	Sydney, Cape Breton County	43,025	39 032	11	
38. H. W. Phillips Ltd.	Mira Gut, Cape Breton County	38,683	36 000	7	
39. Highland Sand & Gravel	New Glasgow, Pictou County	165,805	150 236	13	

Table B-6. (cont'd)

40	Maltz Contracting Ltd	Bridgewater, Lunenburg County	18,400	15 700	7	
41	Ideal Concrete Ltd	Port Hood, Inverness County	13,228	12 000	6	
42	G.E. Keddy (div. L.E. Shaw Ltd.)	Lantz, Hants County	338,193	306 807	7	
43	Kell's Enterprises Ltd	Antigonish, Antigonish County	24,030	21 800	6	
44	Levatte Construction Co. Ltd	Sydney, Cape Breton County	35,216	31 948	10	
45	M. Hoyt Trucking & Excavating Ltd.	Truro, Colchester County	7,728	7 000	4	
46	Malcom S. Mardonald Co. Ltd	Sydney River, Cape Breton County	167,627	152 070	8	
47	Martell's Construction Ltd	North Sydney, Cape Breton County	32,594	29 569	8	
48	Maurice's Ready-Mix Ltd	Kentville, Kings County	74,811	67 868	3	
49	M. D. Holmes Trucking Ltd	Stellarton, Pictou County	2,454	2 226	2	
50	Miller Brothers Excavation Ltd	Truro, Colchester County	22,046	20 000	6	
51	Meadows Sand & Gravel Ltd	Sydney, Cape Breton County	76,436	69 342	9	
52	Moore Enterprises	Deep Brook, Digby County	25,042	23 525	5	
53	Mosher and Rawding Ent. Ltd	Liverpool, Queens County	110,230	100 000	7	
54	Mosher Limestone Co. Ltd	Musquodoboit, Halifax County	13,220	11 993	2	
55	Municipal Ready-Mix Ltd	Sydney, Cape Breton County	190,698	173 000	21	
56	North River Sand & Gravel Ltd	Truro, Colchester County	4,409	4 000	3	
57	Nova Scotia Sand & Gravel Ltd	Halifax, Halifax County	134,459	121 980	13	
58	Parker Mountain Aggregates Ltd	Deep Brook, Annapolis County	155,535	141 100	3	
59	Permanent Concrete Ltd	Folly Lake, Cumberland County	334,140	303 130	17	
60	Pictou West Crushing Ltd	Scotsburn, Pictou County	53,710	48 090	4	
61	R. Ber Construction	Sydney, Cape Breton County	8,644	7 842	3	
62	R. B. Ferguson Construction	Marion Bridge, Cape Breton County	42,924	38 980	3	
63	Satellite Equipment (1972) Ltd	New Glasgow, Pictou County	67,791	61 500	20	
64	Scott Worldwide Inc.	New Glasgow, Pictou County	319,667	290 000	-	
65	Shaw, Vernon H.	Windsor, Hants County	41,116	37 300	2	
66	Standard Aggregates	Halifax, Halifax County	19,555	17 740	3	
67	Standard Paving Maritime Ltd.	Halifax, Halifax County	350,184	317 685	17	
68	Stanley J. Flynn Trucking Ltd.	Lower Wentworth, Cumberland County	1,940	1 760	10	
69	Steed And Evans Limited	Dartmouth, Halifax County	28,660	26 000	7	
70	Tidewater Construction Co. Ltd.	Lower Sackville, Halifax County	256,484	232 681	9	
71	Warren Meritimes Ltd.	New Glasgow, Pictou County	395,897	359 155	16	
72	W.C. Hall & Sons Excavating Ltd.	Cornwallis, Annapolis County	21,495	19 500	4	
73	Wallace Paving & Constr. Ltd.	Truro, Colchester County	241,291	218 888	13	
74	W.K. Sherpe & Sons Const. Ltd.	Avonport, Kings County	22,322	20 250	3	
75	Yarmouth Concrete & Gravel Ltd	Yarmouth, Yarmouth County	155,975	141 500	10	
76	Zutphen Brothers Const. Ltd	Port Hood, Inverness County	11,023	10 000	1	
		Sub-total	7,120,900	6 470 000	449	25,880,000
OTHER (mainly Nova Scotia Department Of Transportation & Communications)			1,664,400	1 509 900	89	6,039,500
		TOTAL (sand and gravel)	8,785,300	7 979 900	538	31,919,500
TOTAL FOR AGGREGATE MATERIALS PRODUCTION			16,838,000	15 104 000	900	67,542,000

[1] average number of people employed during production period
[2] estimate from Department of Mines and Energy sources
[3] waste rock from the tin mine sold as aggregate
ie = included elsewhere
- = not applicable
N/TE production represents shipments, sum of components may not add due to rounding

Table B-7. Miscellaneous commodity production for the calendar year 1989.

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
DIMENSION STONE					
Heritage Memorials Ltd.	Quarry: Nictaux, Annapolis County Plant: Windsor, Hants County	474	430	21	57,200
Nova Scotia Sand and Gravel (Division of L. E. Shaw Ltd.)	Quarry: Marble Mountain, Inverness County	11,023	10 000	3	595,000
Wallace Quarries Ltd.	Quarry: Wallace, Cumberland County	403	366	6	121.500
	TOTAL (dimension stone)	11,900	10 796	30	774,000
PEAT MOSS					
Annapolis Valley Peat Moss Company	Berwick, Kings County TOTAL (peat moss)	10,190	9 244	40	1,073,000[3]
TOTAL FOR MISCELLANEOUS COMMODITY PRODUCTION				70	1,847,000

[1]total number of employees including office, clerical, superivisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value
NOTE - production represents shipments; sum of components may not add due to rounding

APPENDIX C

Coal Exploration by Private Sector Companies

Esso Resources Canada Ltd. conducted a 40 line-km high resolution seismic reflection survey and drilled four diamond-drill holes and two rotary holes for a total of 1579 m in the south and west of the Springhill coalfield. These efforts constitute the first year of a three year coal exploration plan in the Springhill coalfield and Cumberland Basin. Also in the Springhill coalfield, Black Gold Resources reclaimed raw coal waste bank and rail bed material sampled by the Coal Section in 1986 and submitted a plan for establishment of a washplant to continue their operations.